



Precision Strike PEO Forum

July 25-26, 2006

San Diego, CA

Precision Strike PEO Forum 2006 Agenda

Navy Precision Weapons Program: **RADM Timothy Heely, USN**, PEO for Strike Weapons and Unmanned Aviation-NAVAIR

Land Attack Weapons Capability Area Review: **Mr. Clay Davis**, Office of the Under Secretary of Defense for Acquisition, Technology & Logistics

SERVICE PRECISION REQUIREMENTS & PROGRAMS PANEL:

- U.S. Army, **Mr. Sammy Coffman**, Director of the Fort Sill Futures Development and Integration Center (FDIC)

UCAS Development Vision:

- Unmanned Combat Air Systems, **Mr. Dyke Weatherington**, Deputy, OSD UAV Planning Task Force, OUSD (AT&L)
- Navy Unmanned Combat Air System Navy Unmanned Combat Air System Demonstration, **Mr. Marty Deppe**, Navy Unmanned Combat Air Systems

PRECISION WEAPONS COMMAND AND CONTROL:

- Requirements for Air Combat Command, **Colonel Thomas Wozniak, USAF**, Chief, Command & Control, Intelligence, Surveillance and Reconnaissance Division, Directorate of Requirements, HQ Air Combat Command

Predator Precision Weapons Integration and Testing, **Mr. Chris Seat**, Director, USAF Predator Programs Aircraft Systems Group, General Atomics Aeronautical Systems, Inc.

PRECISION STIRKE PEO FORUM
JULY 25-26, 2006-08-11
SAN DIEGO, CA

TUESDAY, 25 JULY

KEYNOTE ADDRESS: *The Honorable Ken Krieg*

Under Secretary of Defense for Acquisition, Technology and Logistics
(Presentation not available for distribution)

NAVY PRECISION WEAPONS PROGRAM: *RADM Timothy Heely, USN*

PEO for Strike Weapons and Unmanned Aviation-NAVAIR

LAND ATTACK WEAPONS CAPABILITY AREA REVIEW: *Clay Davis*

Office of the Under Secretary of Defense for Acquisition, Technology & Logistics

SERVICE PRECISION REQUIREMENTS & PROGRAMS PANEL:

- U.S. Army: ***Sammy Coffman***—Director of the Fort Sill Futures Development and Integration Center (FDIC)
- U.S. Air Force: ***Tom Robillard***—Director, Air to Ground Systems Wing
(Presentation not available for distribution)
- U.S. Navy: ***CAPT Richard “Rhett” Butler***—Deputy Commander Carrier Air Wing 14
(Presentation not available for distribution)

WEDNESDAY, 26 JULY

Precision Weapons Testing: *Lieutenant Colonel Phil Darcy, USAF*

Commander 17th Weapons Squadron, USAF Weapons School, Nellis, Air Force Base
(Presentation not available for distribution)

UCAS Development Vision:

Dyke Weatherington—Deputy, OSD UAV Planning Task Force, OUSD (AT&L)

Marty Deppe—Navy Unmanned Combat Air Systems

(Presentation not available for distribution)

Rick Ludwig—Director of Business Development, Northrop Grumman Corporation

(Presentation not available for distribution)

Rod Lekey—Business Development—UCAS, The Boeing Company

(Presentation not available for distribution)

Kill Chain Panel: (No presentations)

- Unmanned Air Systems—Current and Future Capabilities of Unmanned Systems of Finding Targets and BDA: ***Commander Ed Wolski, USN***

- Tomahawk Engagement Planning: ***Lieutenant Commander Nicole Shue, USN***
- Kill Chain & Approval Process: ***Captain Christian Sprinkle, USN***
Reserves 3rd Fleet/Raytheon
- **Wayne Willhite**—Naval Air Warfare Center, Weapons Division
- **Jack Granger**—Cruise Missile Support Activity Atlantic

PRECISION WEAPONS COMMAND AND CONTROL:

- Tactical Targeting Networking Technology: **Lieutenant Colonel Stephen Waller, USAF**
(Presentation not available for distribution)
- Requirements for Air Combat Command: **Colonel Thomas Wozniak, USAF**
Chief, Command & Control, Intelligence, Surveillance and Reconnaissance Division,
Directorate of Requirements, HQ Air Combat Command

Naval Precision Strike Weapons Testing: *Daniel Radke*

Chief Test Engineer, NAVAIR-Point Mugu, CA

(Presentation not available for distribution)

Predator Precision Weapons Integration and Testing: *Chris Seat*—Director, USAF Predator Programs Aircraft Systems Group, General Atomics Aeronautical Systems, Inc.

A collage of military images. In the top left, a military aircraft flies in the sky. In the top center, a soldier in camouflage gear is shown from the chest up, looking through binoculars. In the top right, a military vehicle is partially visible. In the middle left, a large tank is shown. In the middle right, another tank is shown. In the bottom left, a rocket or missile is being launched, creating a large plume of smoke and fire. In the bottom center, a group of soldiers in camouflage gear are walking in a line. In the bottom right, a line of military vehicles is driving on a road.

Transforming Army Indirect Fires

Sam Coffman
**Director, Futures Development
Integration Center**

Transforming Army Indirect Fires



- Robust mix of fire support systems is required to address the full spectrum of requirements and mitigate against surprise
- Volume, precision, responsiveness (24/7, all weather, all terrain), and range remain critical attributes of a fire support system
- Networked and precision fires offer opportunity to disrupt/destroy enemy capabilities at extended ranges and with greater precision

Army Brief to DEPSECDEF – Sep 02



Networked through battle command
Fully interoperable with Joint systems
Mobile (strategic and tactical)
Fully integrated with maneuver
Lethal (through precision and volume)
Precise effects with area options
Reduced logistics
Ability to mass effects
24/7, all weather, all terrain

To achieve Destructive, Suppressive and Protective effects while minimizing collateral damage and taking advantage of emerging technology



Create the
Thunder

Looking at Precision Needs



***Precision Effects:** Capability to rapidly and accurately locate and attack targets with the required operational responsiveness matched to desired effects (lethal and non-lethal) and the greatest efficiency.*

To achieve precision effects Field Artillery needs:

- *Accurate target location and size*
- *Accurate delivery system location and direction*
- *Timely and accurate meteorological data*
- *Accurate computational procedures*
- *Weapon and ammo information*



Current Operational Need



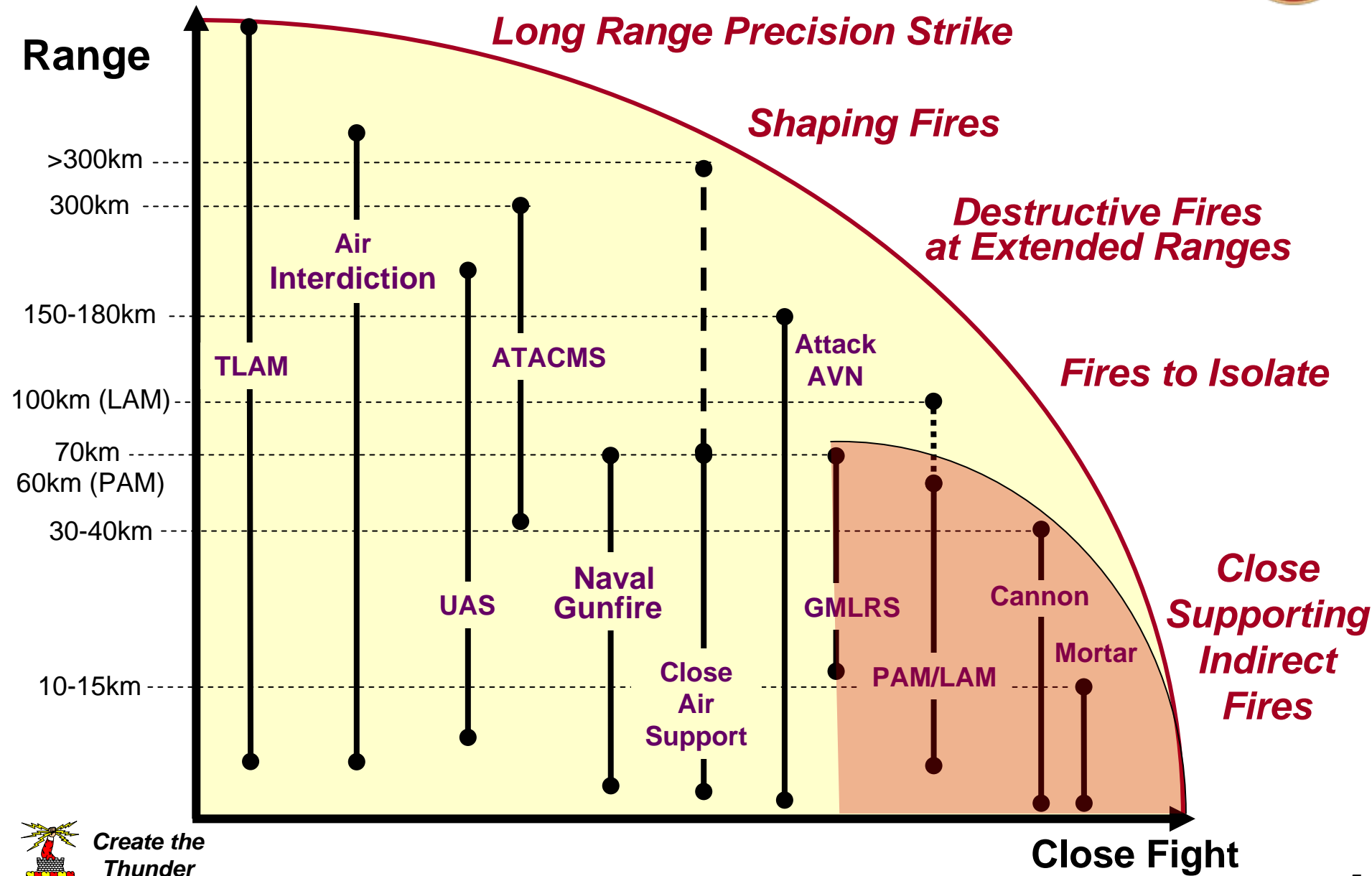
2. . . . ONS succinctly identifies an urgent need for improved munitions in IBCTs . . . Recent XVIII Airborne Corps experience in both Afghanistan and Iraq indicates that GWOT operations requires indirect fire munitions with greater lethality, increased range, and a precision guided capability that limits collateral damage.

XVIII ABC ONS for Improved 105mm Artillery Projectiles
21 Nov 05





Joint Fires Capabilities





Army Munitions Attributes

Non-Precision (Area) Munition	Precision Munition	Precision Guided Munition	Precision Smart Munition
Munition/ submunitions subject to all ballistic conditions on the way to the AIMPOINT.	Munition corrects for ballistic conditions using guidance and control up to the AIMPOINT or submunitions dispense <i>with</i> <i>terminal accuracy</i> <i>less than the lethal</i> <i>radius of effects.</i> Submunitions subject to ballistic conditions to AIMPOINT.	Munition senses <i>energy reflected</i> <i>from a target</i> and uses <i>guidance and</i> <i>control</i> to the TARGET. Requires a <i>laser</i> <i>designator</i> in the loop for target designation.	Munition/ submunitions <i>autonomously</i> <i>searches, detects,</i> <i>classifies, selects,</i> <i>and engages</i> TARGET(s). <i>Has a limited target</i> <i>discrimination</i> <i>capability.</i>





Dominant target in theater today for indirect fires



Looking at Responsiveness

		Required Responsiveness (minutes)			
		2	10	60	>60
Range to Target	0 – 15 Km	27	8		15
	15 – 40 Km	4	5	1	24
	40 – 60 Km				24
	60+ Km	9		1	22
	NA			1	
Total Mission Profiles		40	13	3	85

Of the 141 mission profiles:

- 40 required less than 2 minutes
- 13 required more than 2 but less than 10 minutes
- 3 required more than 10 but less than 60 minutes
- 85 required more than 60 minutes

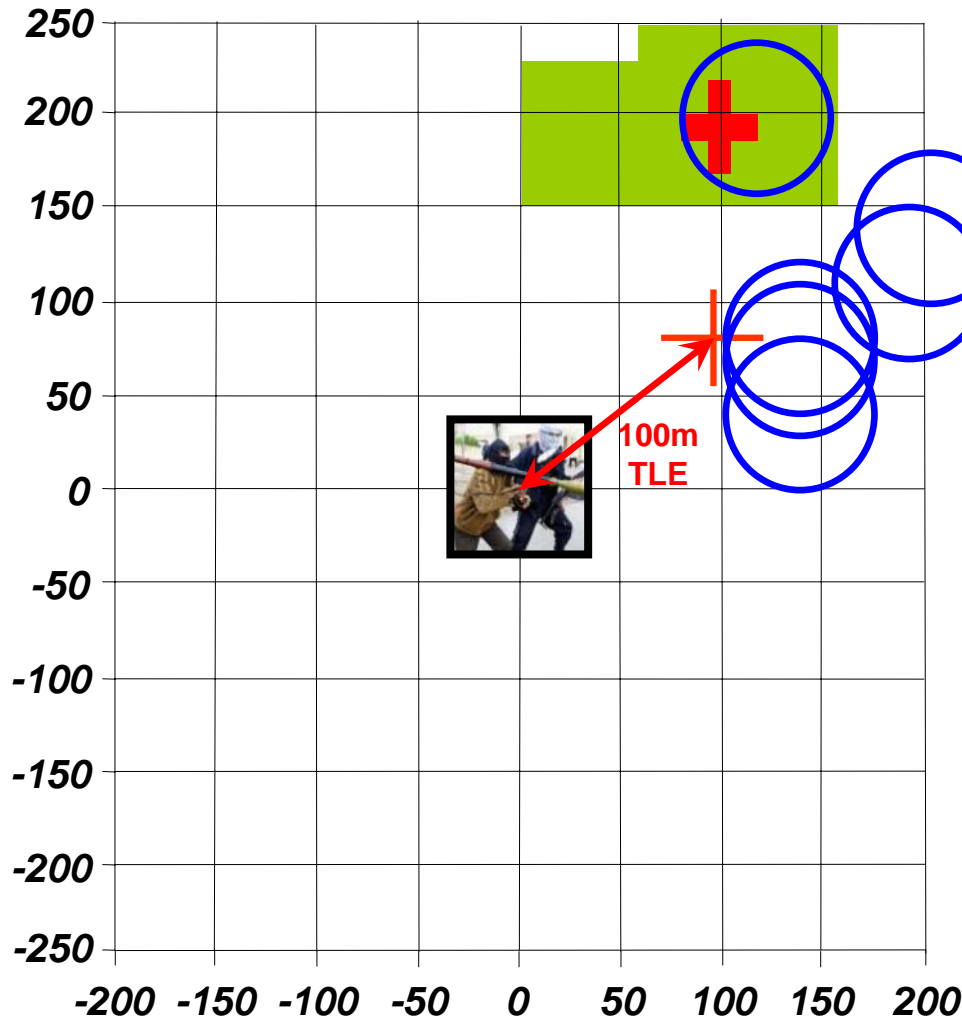
For an FCS-equipped BCT to execute its concept, high payoff targets and most dangerous targets required very responsive fires:

- 28% of the mission profiles required 2-minute responsiveness and 38% required a response within 10 minutes
- 68% of the targets that required a response within 2 minutes were in the range band of 0-15km





Where We Were

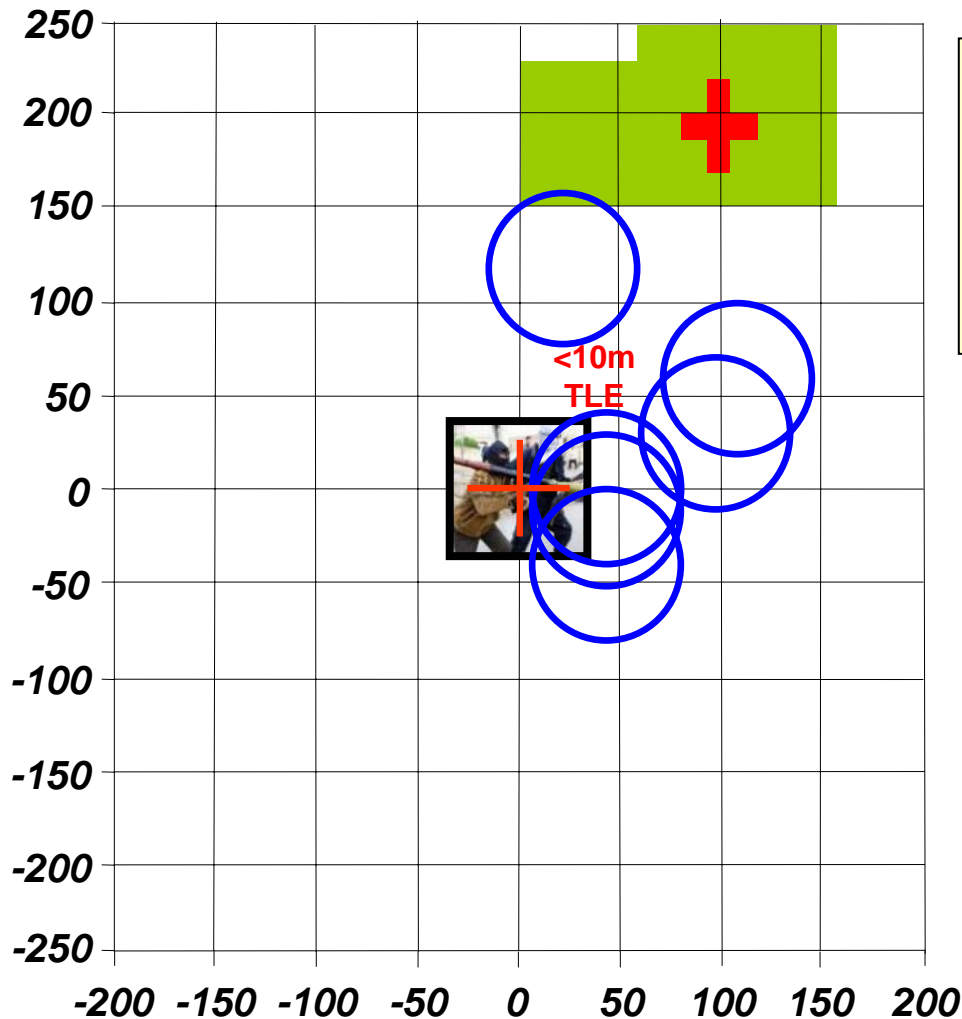


- High probability of collateral damage
- Low probability of achieving desired effects on target
- Large expenditure of ammunition to have high fractional damage

. . . no precision targeting with area munitions



Where We Are

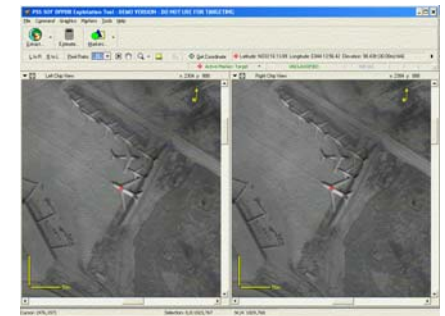


- Probability of collateral damage precludes use in most urban engagements
- Larger munition expenditures required to achieve desired effects



Fire Support Sensor System – 9M TLE at 10 KM

Precision Strike Software – Special Operating Forces

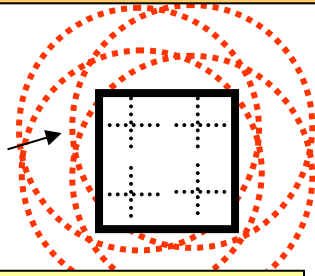


. . . *precision targeting with area munitions*

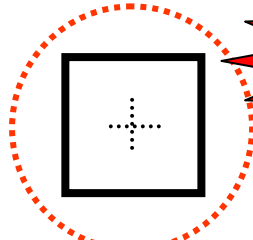
Looking at Aiming Points



Area Target – Aim point selection



Conventional Aiming:
Accounts for delivery errors (PEr & PE_d) to ensure target coverage

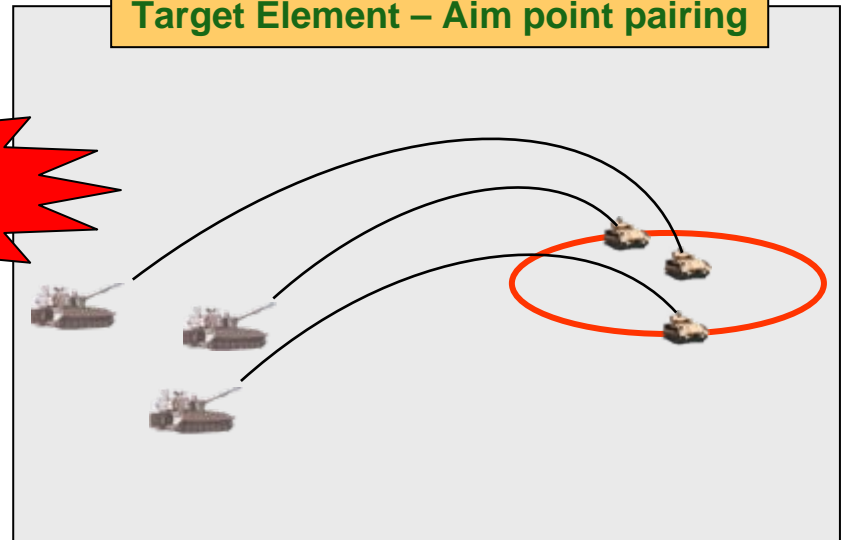


Precision Aiming:
Reduced # of aim points & munitions

Less rounds for desired effect

Target Element – Aim point pairing

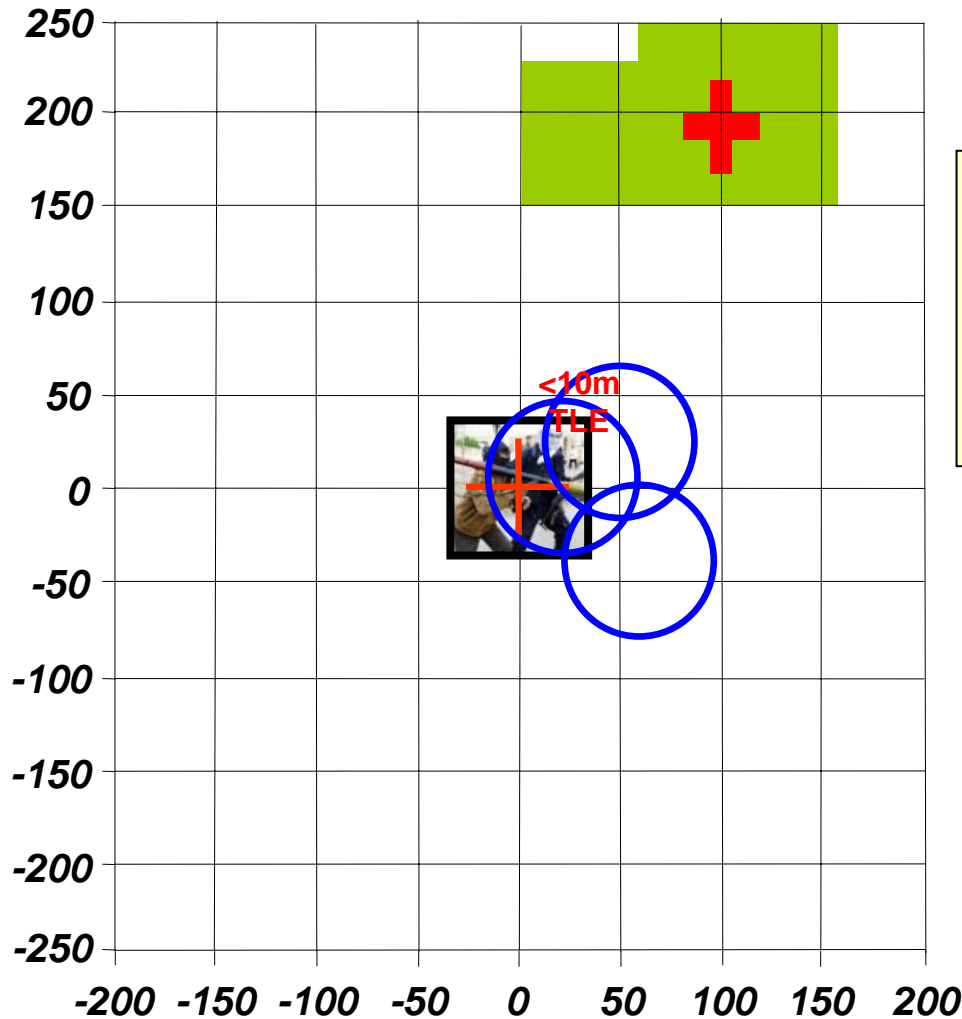
Enables precision targeting



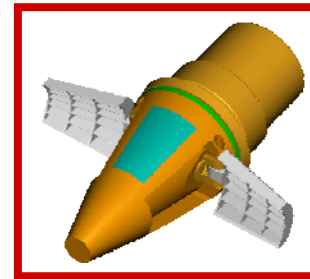
Create the
Thunder



Where We're Headed



- Reduces CEP to enable more engagements in most urban environments
- Reduces expenditures required to achieve desired effects

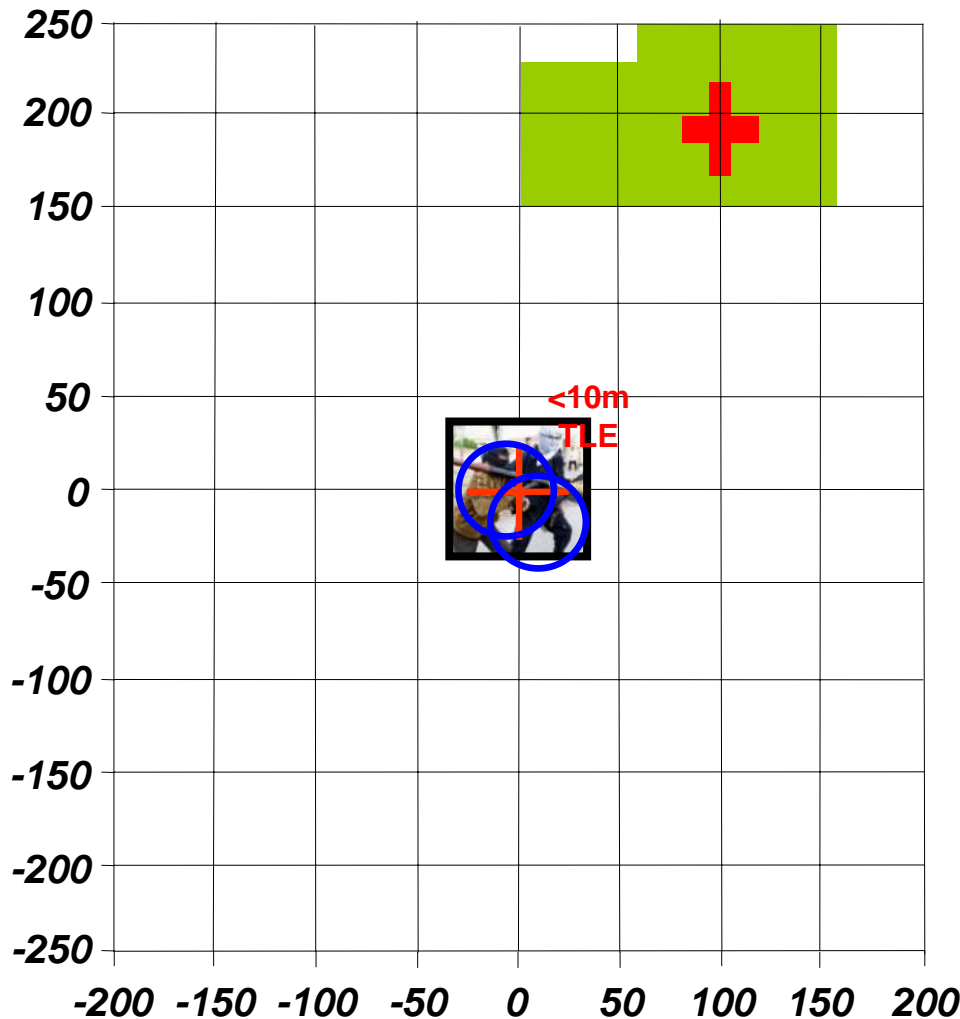


- <50M CEP Initial
- <30M CEP Threshold
- <10M CEP Objective
- Both 155mm and 105mm

. . . precision targeting with Precision Guidance Kit



Where We Need to Be . . .



- Preferred choice when collateral damage must be minimized
- Vertical trajectory desired
- Need scaleable lethality
- Ability to discriminate without designation
- Significantly fewer rounds expended to achieve desired effects

. . . *precision targeting with precision munitions*



Other Requirements



Common:

- Location
- Direction
- Elevation

Improved Positioning and
Azimuth Determining
System



Profiler

- Meteorological data on demand
- < 30 minutes staleness
- Target area met capability



- Routine digital operations
- All members of the team



Create the
Thunder





**Create the
Thunder**

Precision Munitions Mix Analysis



- The FY08 HBCT forces and the FY14 HBCT and FCS BCT forces will be able to accomplish their missions with *a subset* of the Army's collection of precision munitions programs.
- Employing a subset of Army precision munitions (APM) can cause a greater reliance on joint capabilities.
- APM can be layered into 4 tiers based upon PMMA findings, Threat and operational considerations:

– Tier 1: those *central to any mix*, capable of engaging multiple *likely* mission profiles and that clearly dominate mix lethality.

Tier 1: Excalibur (U), Hellfire, MRM, GMLRS (U)

– Tier 2: those that best augment Tier 1 to engage the *most likely* Threat behaviors or dispositions.

Tier 2: PGMM, PGK

– Tier 3: those that *mitigate risk to the force* in case of *less likely* Threat behaviors or dispositions.

Tier 3: PAM or CSS

– Tier 4: those that *provide a marginal capability* to the force under prevailing conditions.

Tier 4: APKWS Bk I, GMLRS (D)

- APM mixes *reduced* the overall *logistics burden*.



Enhanced Delivery



Paladin

- Remains a great system
- Challenge is to ensure keep it operationally viable for many years to come
- Probably the system in Fire Brigades for at least 30 more years



FCS NLOS Cannon

- Prototype delivery begins in FY 08
- Challenge is to maintain commonality with other MGVS
- Migrate to Stryker BCT at some point

- *Fewer types of systems*
- *Enhanced deployability*
- *Enhanced sustainability*



Create the
Thunder

PSS-SOF Targeting



BareBack Version 1.1.2.8

1) IP/CP: [] Edit NM Km DD:MM:SS **6** Config

2) Head: [None] DMag: 3) Dist: 0.000000 Connect

Target: ☒ XMIT Loc ID: 0 GPS

4) Tgt El: 148.718 ft.(msl) Priority: [Not Set] Send

5) Desc: AIRCRAFT DB

6) Lat: 33.16.4892 Deg N Lon: 044.14.1449 Deg E **3** New

CE: 146. (m) LE: 8.2 (m) Save

7) Mark: Beacon Code: 1688 DPSS

1 ☒ XMIT Loc ID: 0 **1**

Lat: 33.16.7500 Deg N Lon: 044.16.167 Deg E

☒ Update Elev: 0.000 ft.(msl) LRF Correction: 0.00 Deg

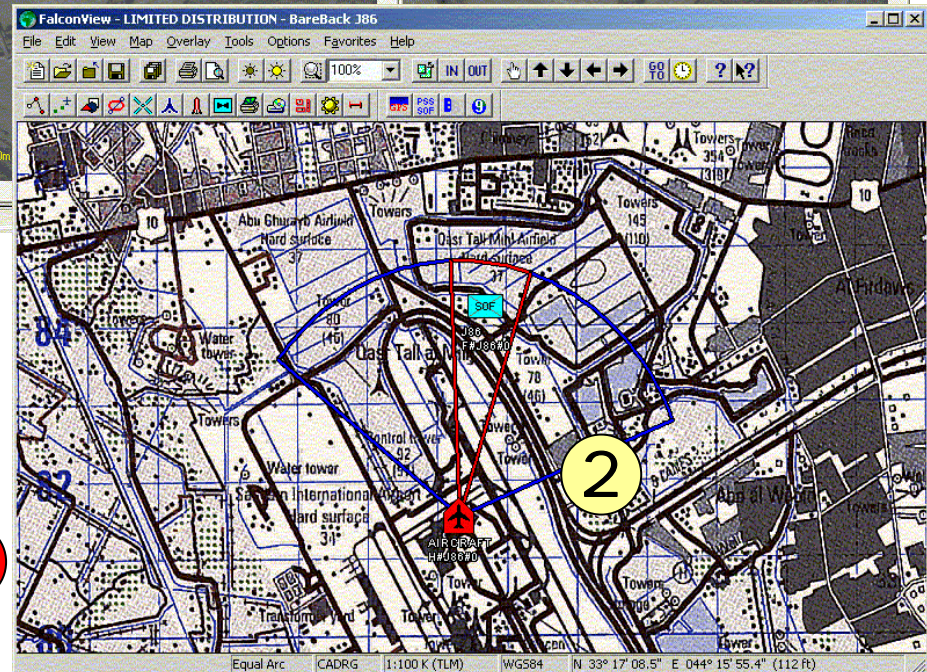
CE: 100.0 (m) LE: 0.0 (m) **2** view

9) Egress: [On] **5** Head (DMag): 140.00

Remarks: Rng to Tgt (m): 600

TOT: []

Image: [] Browse



6



1



1



Create the Thunder



Airspace Geometries

THIS IS THE VOLUME OF AIRSPACE WE WANT CLEARED WITH THE MISSILE/PROJECTILE FLIGHT PATH.

Aircraft would essentially be commanded to stay out of this airspace until "rounds complete".

FLIGHT PATH

250m Radius (Default)

MAXIMUM ALTITUDE OF AIRCRAFT



Civil Airway



GT

TARGET

PLATFORM

- In this scenario there is no need to clear civil air traffic because the MFP is calculated and sent to TAIS.
- The MFP does not conflict with the airway.
- Potential conflicts with civil traffic are greatly reduced using this method.



Create the
Thunder

The background of the slide is an aerial photograph of the Pentagon and its surrounding area in Arlington, Virginia. Overlaid on this image is a large, semi-transparent circular seal of the United States Department of Defense. The seal features an eagle with wings spread, perched on a shield with the American flag's stars and stripes. The words "DEPARTMENT OF DEFENSE" are arched across the top, and "UNITED STATES OF AMERICA" is arched across the bottom. The text "Land Attack Weapons Capability Area Review" is centered over the seal in a large, black, sans-serif font. Below it, the text "An Update" is also centered in a slightly smaller font.

Land Attack Weapons Capability Area Review

July 25, 2006

Clayton V. Davis
Staff Specialist
DUSD(A&T)/PSA-AW



Capability Area Reviews

Capability Roadmaps

- Provides Department an overall context and understanding of a mission area
 - Integrated Air and Missile Defense, Joint Battle Management Command and Control, Electronic Warfare, Land Attack Weapons
- Critical Link to roadmaps
 - Provide a framework for decision-making
 - Highlight trade spaces, inform decision-makers, and capture decisions made
 - For Land Attack Weapons – Conventional Engagement Capability Roadmap (Version 0 released, and Version 1 in work)



Conventional Engagement Portfolio

GPS & Comm

ISR

- **Large Portfolio:**
- **Army, Air Force, Navy, Marine Corps**
- **Air-, ground-, and surface-launched**
- **Precision capability (INS/GPS, seekers, etc)**
- **Direct attack to long range standoff**
- **Prosecute fixed, relocatable, and moving targets**





Agenda

- Calendar year 2005 activities
- 2005 Overarching Integrated Product Team (OIPT) and Defense Acquisition Board (DAB) meetings
- Focus for 2006
- Way ahead



CY 2005 Focus

Topics of Interest

- Energetic Technologies
 - Warheads
 - Fuzes
 - Insensitive Munitions
- Geo-Intelligence
 - Targeting
 - Target Location Error*
- SAASM Policy*

* *USD(AT&L) Special Interest*





CY 2005 Focus

Topics of Interest (cont)

- Moving Target Challenges
- Munitions Requirements Process
- Joint Organizational Structures
 - Joint Air Dominance Organization (JADO)
- Test/Training Range Infrastructure
- Conventional Engagement Capability Roadmap





CY 05 CECR Activity

- Completed Version 0 in late Spring
 - Incorporated two Joint Staff (J8) assessments
 - Moving Target Gaps
 - Area Weapons (submunitions) sufficiency
- Routed for 06 Review, followed by FO/GO
- Vetted through the JCIDS process
- Signed jointly by VCJCS and USD(AT&L)
- Presented at the July DAB



Version 0 Overview

- **Purpose**

- Document an initial capabilities-based review of the DOD's ability to attack land-based targets
- Inform decision makers of known weapons-related issues and surface issues for action

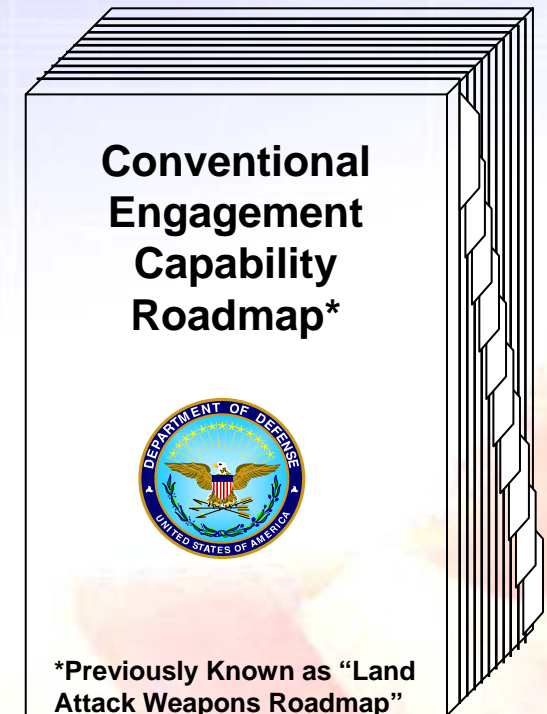
- **Scope**

- Focus is on Engage link of the Find, Fix, Track, Target, Engage, and Assess kill chain, specifically the weapon component
- Included are conventional kinetic munitions in inventory or proposed for production during next two FYDPs (as of PB-05)
- Target engagement capabilities of interest
 - Moving targets
 - Area targets



Version 0 Document Structure

1. **INTRODUCTION**
 - Purpose
 - Scope
 - Key Terms and Understandings
 - Assumptions and Limitations
 - Challenges
2. **ROADMAP CONTEXT**
 - Strategy-to-Solution Construct
3. **DEPENDENCIES AND ISSUES**
 - Kill Chain
 - Engagement Interdependencies and Issues
4. **WEAPONS INFORMATION**
 - DOD Weapons Portfolio
 - Joint Conventional Munitions Database
5. **ENGAGEMENT CAPABILITY ASSESSMENT RESULTS AND GAP ANALYSIS**
 - Moving Target Assessment
 - Area Target Assessment
6. **ROADMAP**
7. **EXPERIMENTATION AND EMERGING TECHNOLOGY**
 - Conventional Weapon Science and Technology Investments
 - Future ACTDs
 - Other Emerging Technology Efforts
8. **CONCLUSIONS & RECOMMENDATIONS**
9. **APPENDICES**





Joint Conventional Munitions Database (JCMD) – source data for Roadmap

Weapons ▾ Predefined Set ▾ User Defined Set ▾

Land Attack Weapons		Weapon Types	Land Attack Weapon(s) Selected
155 MM XM982	Excaliber	ATACMS	
AGM-114	Hellfire	Hellfire	
AGM-114L	Longbow	GP Bombs	
AGM-130/A	AGM-130 (Mk-84)	Cluster	
AGM-130/C	AGM-130 (BLU-109)	LGB	
AGM-142A/B	AGM-142A (BF)	JDAM	
AGM-142C/D	AGM-142C (Pen)	Maverick	
AGM-154A	JSOW (CEM)	JSOW	
AGM-154B	JSOW P3I (SFW/P3I)	JASSM	
AGM-154C	JSOW (Unitary)	WCMD	
AGM-158A	JASSM	TLAM	
AGM-158B	JASSM ER	SLAM	
AGM-65B	Maverick	AGM-130	
AGM-65D	Maverick	Have Nap	

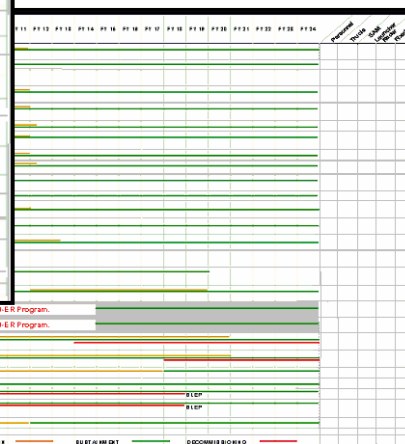
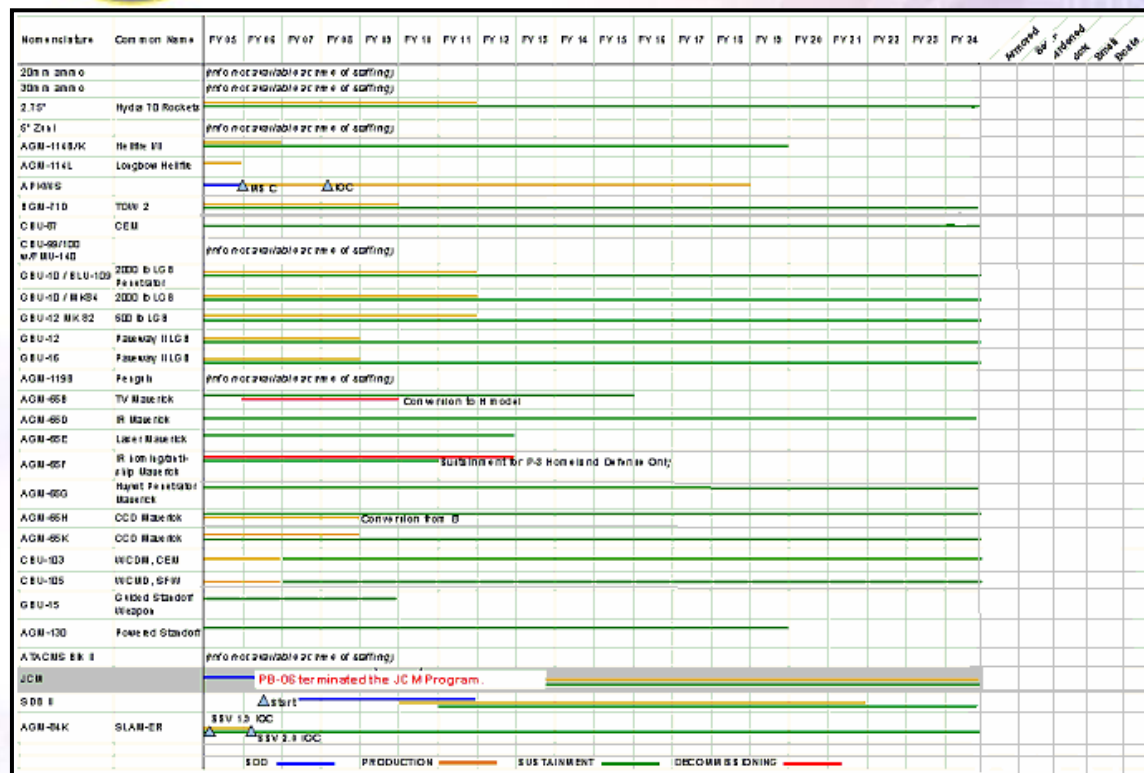
WEAPON CHARACTERISTICS

Service <input type="checkbox"/> Army <input type="checkbox"/> Marines <input type="checkbox"/> Air Force <input type="checkbox"/> Naval	Weapon Effect <input type="checkbox"/> Point/Penetrator (0-6' RIC) <input type="checkbox"/> Point/Penetrator (7-15' RIC) <input type="checkbox"/> Point/Penetrator (>15' RIC) <input type="checkbox"/> Point/Blast Fragmentation <input type="checkbox"/> Point/Anti-armor <input type="checkbox"/> Area Denial <input type="checkbox"/> Area Destruction/Hit to Kill Submunition <input type="checkbox"/> Area Destruction/Unguided Submunition	Range <input type="checkbox"/> Direct Attack <input type="checkbox"/> Close Standoff <input type="checkbox"/> Standoff > Point Defense <input type="checkbox"/> Standoff > Area Defense <input type="checkbox"/> Standoff > Theater Defense	Weather <input type="checkbox"/> All Wx <input type="checkbox"/> ILOS <input type="checkbox"/> CLOS	Accuracy <input type="checkbox"/> Precision <input type="checkbox"/> Accurate <input type="checkbox"/> Guided <input type="checkbox"/> Unguided
TLE Level <input type="checkbox"/> Level 0 <input type="checkbox"/> Level 1 <input type="checkbox"/> Level 2 <input type="checkbox"/> Level 3		Guidance/Seeker <input type="checkbox"/> None <input type="checkbox"/> Autonomous/BOC <input type="checkbox"/> Autonomous/Terminal Seeker <input type="checkbox"/> MITL with Terminal Seeker	Day/Night <input type="checkbox"/> Day Only <input type="checkbox"/> Day/Night	C4ISR Load <input type="checkbox"/> None <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High
		Midcourse Guidance <input type="checkbox"/> None <input type="checkbox"/> GPS/INS <input type="checkbox"/> INS/IMU		

ILOS NUM



Roadmap Content





FY 05 CAR DAB

- ADM Direction:
 - Continue LAW IIPT; build Conventional Engagement Capability Roadmap Version 1
 - Include weapon/target pairing and surface-to-surface area fires assessments
 - Focus on gaps, overages, and identification of marginal value in inventory
 - Updated Munitions Requirements Process and test range information
 - Maintain the Joint Conventional Munitions Database and Land Attack Module
 - OUSD(AT&L), in coordination with the Joint Staff (J8) and Services, assess potential joint solutions for INS/GPS/laser-guided munitions



CY 06 Efforts

- Joint Staff (J8) completed the weapons targets pairing assessment
 - In JCIDS staffing
- The Army, in coordination with Marine Corps and Naval Surface gunfire, developed a plan of action for surface-to-surface fires assessment
 - The LAW IIPT reviewed and agreed the plan was feasible
 - The plan calls for bi-monthly Interim Progress Reports with a final assessment, JCIDS-ready by April 2007
- Continued attention to Joint Management Structures
 - Joint Air Dominance Organization



CY 06 Efforts (cont)

- Continued improvements in Geo-Intelligence and Target Location Error (TLE)
- Continued attention by Director, Defense Research and Engineering to allocating weapon-related Science and Technology
 - Fuze and warhead technologies
 - Power sources
- Continue to monitor Munitions Requirements Process
- Cross-weapon programmatic issues
 - Universal Armament Interface & Common Launcher
 - Weapons Data Link – Network
 - Test ranges infrastructure



Surface-to-Surface/Area Fires

- The Army, Training and Doctrine (TRADOC) has Lead on this assessment
 - Working with Naval Gunfire, ground Marine Corps and Air Forces
- Assessment requires one year – completes April 2007
 - Informs CECR and POM 10 – 15
- Categories of Munitions
 - Surface-to-surface indirect fires, area fires for suppression, precision and non-precision fires, air-to-surface
 - direct fires not considered



Surface-to-Surface/Area Fires

- Scenarios/Vignettes will represent the approved Multi-Service Force Deployments (MSFD)
 - Department of Defense Analytic Agenda
 - Consistent with the Defense Planning Scenario descriptions
 - Consider multiple types of terrain such as urban, desert and mixed
- Target Sets will include mobile, fixed, hard and soft, or any combination
- Timeframe for the analysis is FYDP 2010-2015

Surface-to-Surface/Area Fires Issues

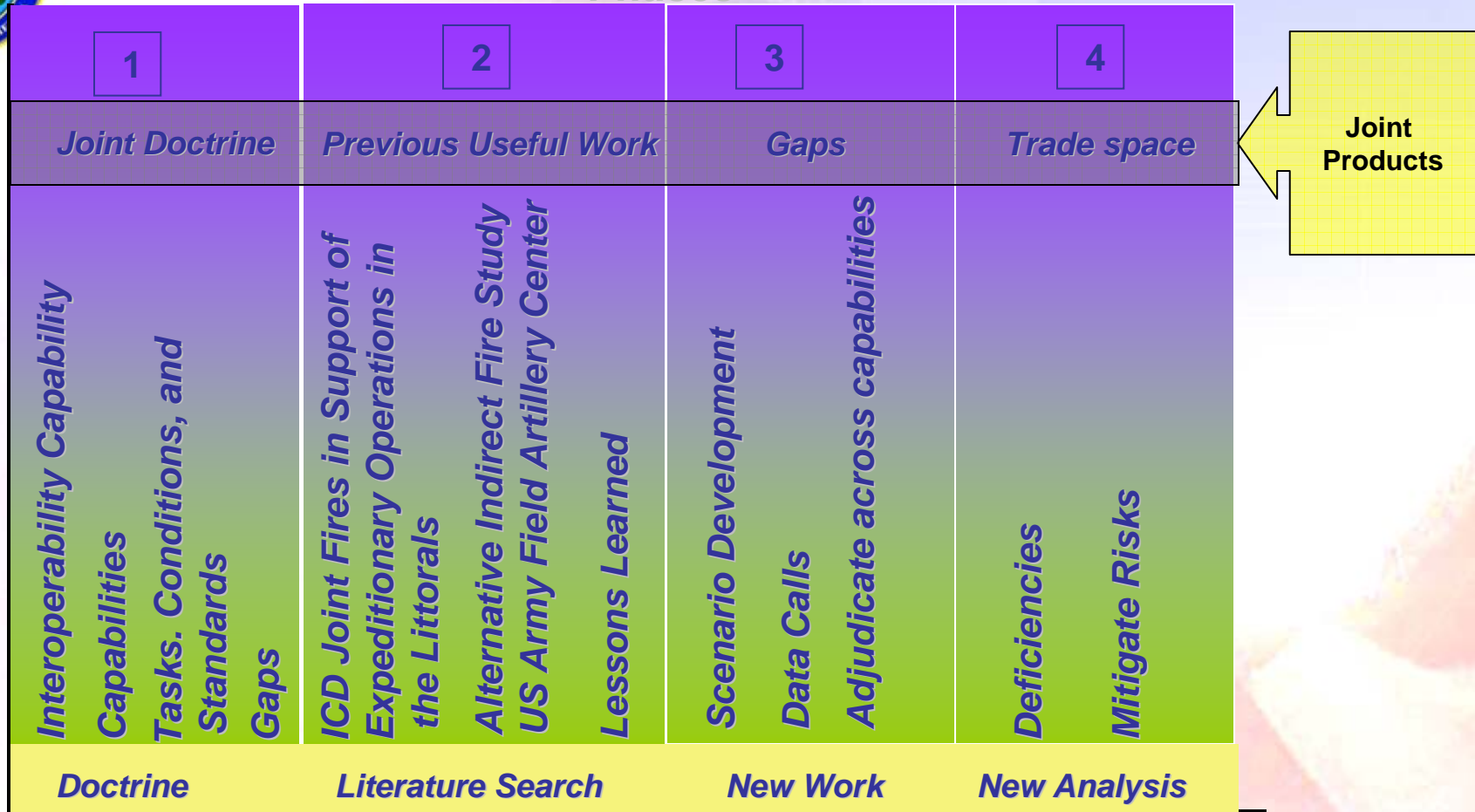


- **What are the Joint fires doctrinal, organizational, and operational concepts for Army, Navy, Air Force and Marine Corps delivered munitions?**
- **Where, when, and why do we need to be precise?**
- **What are the Joint fires capability gaps?**
- **What are the required C4ISR enablers?**
- **What redundancy or duplication of capability is needed to reduce risk?**
- **What target sets/profiles require what munitions?**
- **What are the capability trades among Joint surface-to-surface and air-to-surface fires for the comprehensive set of surface targets?**
- **What are the capability trades among target location error, weapon precision, and weapon effects radius for Army surface-to-surface and air-to-surface munitions for the comprehensive set of surface targets?**
- **How do concepts of operation and doctrine change over time to reflect force transformation?**



Surface-to-Surface/Area Fires Study Implementation Timeline

Phases

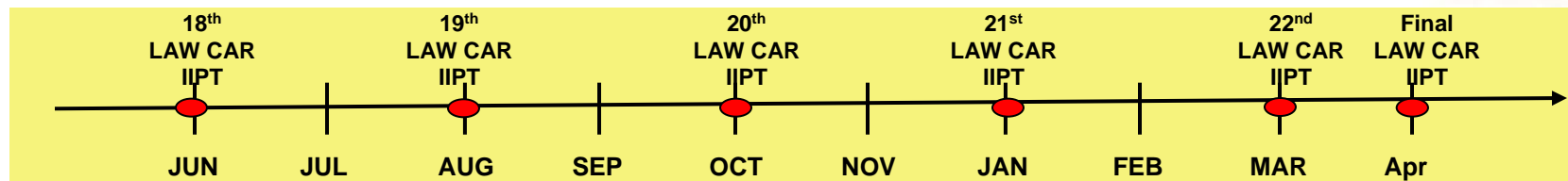


Jun-Aug 06

Sep-Nov 06

Dec 06-Feb 07

Mar-Apr 07





Surface-to-Surface/Area Fires

Proposed Army Educational Topics

Near-term:

- Army will present FCS Organizational and Operational Concept at the LAW CAR IPT (Aug 15, 2006)

Mid-term:

- CAA present a QWARRM brief
- OPNAV and Air Force A5R present NNOR and NCAA briefs
- U.S. Marines presentation on Supporting Fires Operational Concept (TBD)

Long-Term:

- Army will present Modular Force Organizational and Operational Concept at the LAW CAR IPT (Oct 06 – Date TBD)



Joint Management Structures

- Joint Air Dominance Organization (JADO)
 - Mission is to produce and *maintain a coherent*, joint Air Dominance and Airborne Electronic Attack Roadmap
 - A formalized process that will survive the Resource Officer tenure
 - Three pillars
 - Counter-air/counter Air-defense
 - Air-launched strike weapons
 - Airborne Electronic Attack
 - Charter MOA at Army Staff



Geo-Intelligence/TLE

- National Geospatial Intelligence Agency (NGA)
 - Continues activities enhancing GEOINT
 - Comprehending objects and events
 - Planning and executing operations
 - Assessing effects
 - Meets most stringent TLE requirements for weapons
 - non-expedient methods of DMPI mensuration
 - Pursuing multiple technical approaches to bring necessary accuracy and consistency to expedient methods of DMPI mensuration



Science and Technology Resource Allocation to Weapons

- Continue to monitor DoD Fuze IPT activities
 - Technology plan status
 - Industrial base policy
 - POM 08 Issue to increase S&T
- Insensitive Munitions Technologies
- Novel energetic materials
- Thermobaric and dial-an-effect warheads



Munitions Requirements Process

- Fall of 06 will begin POM 10 MRP
 - Advance schedule from previous cycles
 - Munitions Requirements may suffer as Department focus changes
 - Force Structure, Stability Ops, Special Ops, etc.
 - Focus will be on precision munitions
 - Affect to Industrial base
 - Fewer procurements
 - Requirements such as IM drive higher costs
 - Munitions generally pay bills



Cross-Weapon Programmatics

- Universal Armament Interface and Common Launcher
- Weapons Data Link – Network
- Test Ranges Infrastructure



Summary

- A good forum for multi-organization team
- LAW CAR process has been a good communication tool
- Lots of diverse focus areas being reviewed
- We continue to investigate opportunities for improving weapons portfolio



Back-up



Surface-to-Surface/Area Fires

US Army Precision Munitions

Candidates

155 mm Cannon:

- M549A1 HE w/ PGK
- M864 DP ICM w/ PGK
- Excalibur (Unitary)
- Common Smart Submunition (CSS)
- M2005 HE w/ CCF
(From the Advanced Cannon Artillery Ammunition Program)
- *KEAPER - Kinetic Energy Artillery with Precision & Extended Range (Excursion)*

120 mm Mortar:

- PGMM

MLRS/HIMARS:

- GMLRS (Unitary)
- GMLRS (DP ICM)
- Common Smart Submunition (CSS)
- ATACMS (Unitary)
- ATACMS (DP ICM)

NLOS-LS:

- PAM

MCS/M1A2SEP/MGS:

- MRM

*ARV variants:

- PAM
- Hellfire

AH64/ARH:

- Hellfire
- APKWS Blk I

AUAV:

- Hellfire
- APKWS Blk I
- Viper Strike

*ammunition resupply vehicle, armored recovery vehicle, armored repair vehicle



Surface-to-Surface/Area Fires

Joint Precision Munitions

Candidates

US Air Force/Naval Air Force

- AGM 88 (HARM)
- GBU 10,12 (LGB)
- GBU 31,32,38 (JDAM)
- AGM 65 (MAVERICK)
- AGM 158 (JASSM)
- GBU 29 (SDB/250 lb)
- WCMD (SFW/CEM)
- AGM 154 (JSOW)
- GBU 24 (BLU 109)

US Navy Surface

- Naval Fire Support (ERGM)

US Marine Corps

- HIMARS



Surface-to-Surface/Area Fires

Non-Precision Munitions Candidates

(Surface-to-Surface and Air-to-Surface)

US Army

ADD/modify

Cannon

155 mm

105 mm

Mortars

81 mm

61 mm

AH-64

Hydra-Rockets

US Air Force

MK 82

MK 83

MK 84

CBU 87/B

US Marine Corps

ADD/modify

US Navy

CBU 78

MK 82

MK 83

MK 84



Surface-to-Surface/Area Fires

Definitions

- Area Fires
 - Area bombing (DoD, NATO) – Bombing of a target which is in effect a general area rather than a small pinpoint target
 - Area target (DoD, NATO) – A target consisting of an area rather than a single point
- Suppressive Fires
 - Suppressive Fire (DoD) – Fires on or about a weapons system to degrade its performance below the level needed to fulfill its mission objectives, during the conduct of the fire mission
 - Suppression Mission (DoD) – A mission to suppress an actual or suspected weapons system for the purpose of degrading its performance below the level needed to fulfill its mission objectives at a specific time for a specified duration



Surface-to-Surface/Area Fires

Additional Definitions

- Neutralization Fire (DoD) – Fire which is delivered to render the target ineffective or unusable
- Destruction Fire (DoD) – Fire delivered for the sole purpose of destroying material objects



Surface-to-Surface/Area Fires

Use of Area/Suppressive Fires

- **Echelons that use Area/Suppressive Fires**
 - Maneuver elements, Brigade and below (DS Artillery Battalion and organic mortars)
 - Divisions (SEAD in support of rotary and fixed-wing missions)
- **Area/Suppressive Fires are used when:**
 - Responsiveness is more important than precision
 - Target is a large formation or facility
 - Large Target Location Error is indicated
 - Target is undefined/unobserved

Surface-to-Surface/Area Fires



How are Area/Suppressive Fires:

- **Called** – FM Voice or digital call for fire, generally initiated at small unit (platoon/company) level.
- **Controlled** – Generally initiated as an “Adjust Fire” mission, meaning the firing unit delivers one round at the reported target location and the observer adjusts subsequent rounds before “Fire for Effect”
- **Delivered** – Area/Suppressive Fires may be delivered from any number of weapons systems, including Artillery and Mortars, Naval Surface Fires, Fixed/Rotary-wing CAS, as well as direct fire weapons

Surface-to-Surface/Area Fires



Roles for Area/Suppressive Fires

- Standard Roles for Area/Suppressive Fires
 - Screening the initial Point of Penetration
 - Preparatory Fires
 - Close fire support
 - Disruptive deep fires
- Non-Standard Roles for Area/Suppressive Fires
 - Clearing IEDs from routes
 - Clearing minefields



Surface-to-Surface/Area Fires Fallujah 2004

US Army After Action Reports (AAR) Comments

“...the physical and psychological effects of massed artillery fires were the *preferred* effects.”

“...Close Air Support (though extremely effective on planned targets) was not a substitute for responsive artillery and mortars.”

“Fire missions took less than two minutes from call-for-fire to rounds down range.”



Surface-to-Surface/Area Fires

Fallujah 2004

USMC AAR Comments

“Fixed wing CAS is an enormous weapon that has great effects on the ground. It took entirely too long for bombs to be dropped when Marines were in contact. The minimum safe distance of the ordnance was too great in order for even the block to be isolated and that allowed the enemy to escape countless times.”

“...rotary wing CAS was extremely timely, but the effects on target were not extraordinary.”

“Mortars and artillery proved effective by forcing the enemy to stay in the houses and not allowing the enemy to fight the Marines in the streets.”



Surface-to-Surface/Area Fires

Considerations

- Target Location Error (TLE)
 - Observer error, unobserved or undefined target
- Responsiveness
 - Situation requires immediate support vice allows time for increased precision
- Volume
 - Quantity desired to allow maneuver course of action
- Proximity of friendly forces
 - Location, degree of protection, situation



Navy Unmanned Combat Air System Demonstration

Presentation to
Precision Strike Association

25-26 Jul 2006



CAPT Rich Brasel, USN
Navy UCAS Program Manager



Outline



The Future of Naval Unmanned Aviation

- **Introduction**
- **Navy UCAS Evolution**
- **Carrier Demonstration (UCAS-D)**
- **UCAS-D Schedule**
- **Summary**

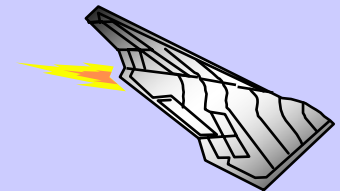


Introduction

The Future of Naval Unmanned Aviation

- **Program Goals:**
 - **Demonstrate Carrier Suitability of Persistent ISR Relevant, Unmanned, LO-Planform Air Vehicle**
 - **Mature Critical Technologies Prior to Potential Milestone Decision**
 - **Maintain Competitive Environment**

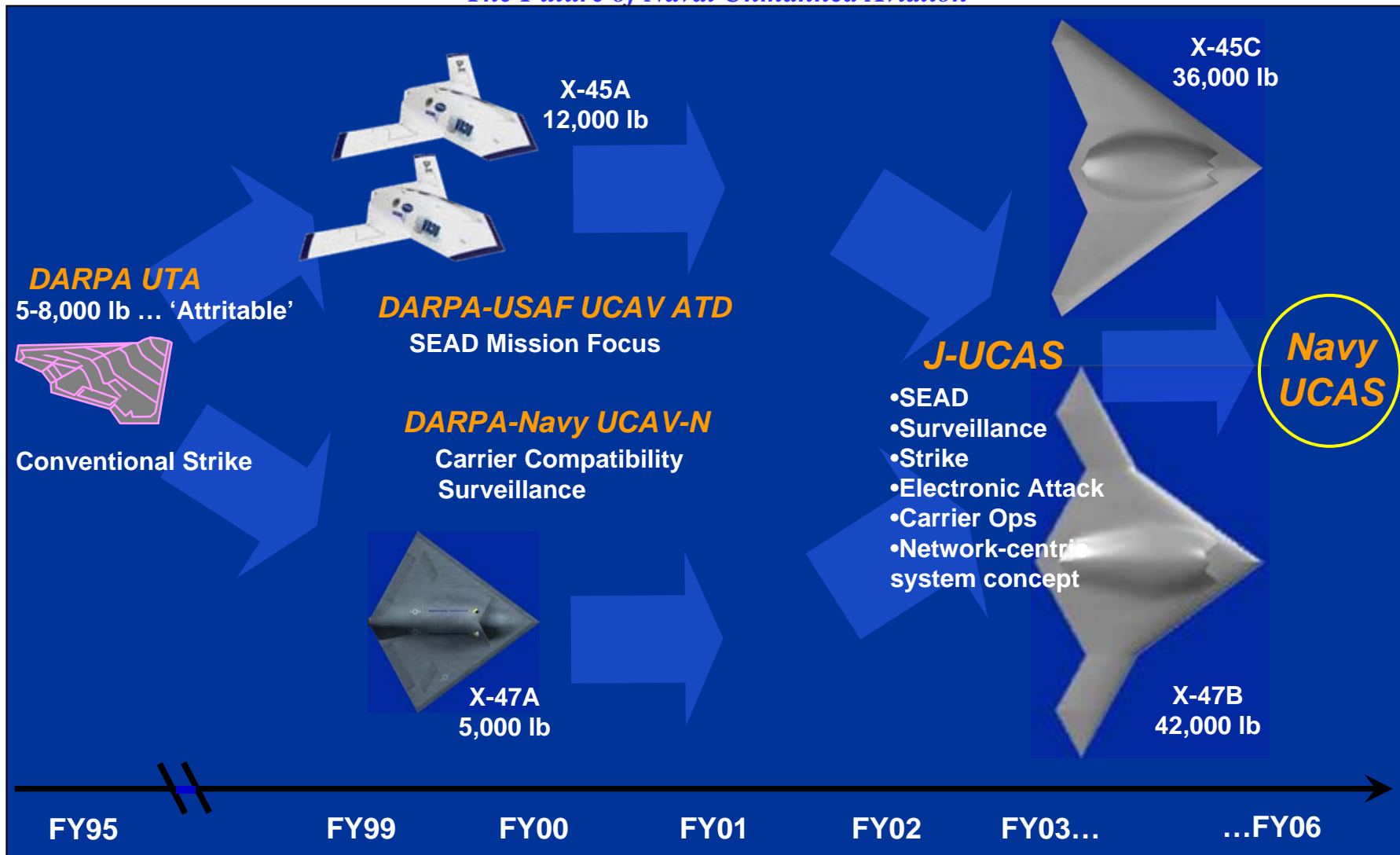
UCAS-D System Not Intended For Operational Use





UCAS Evolution

The Future of Naval Unmanned Aviation

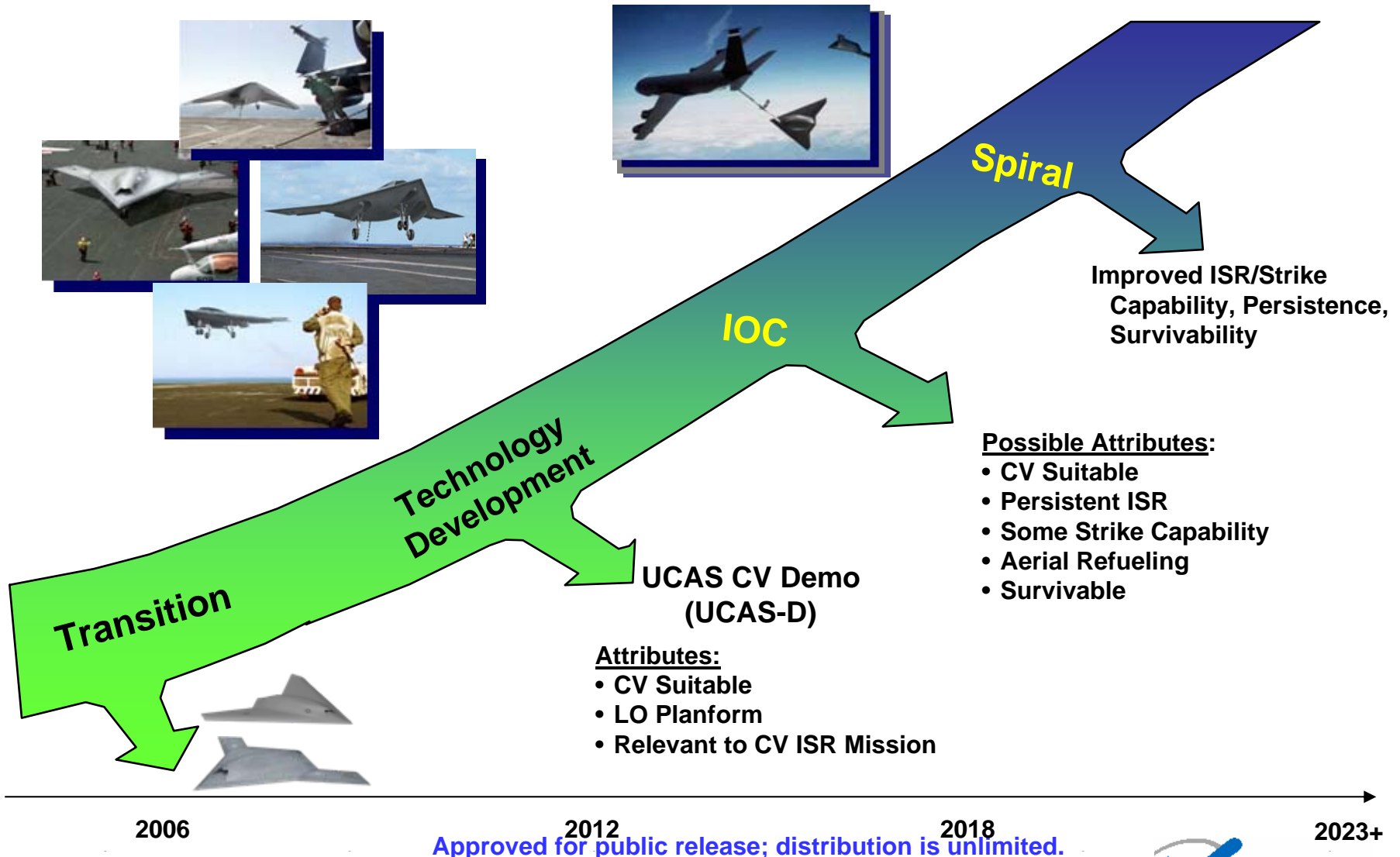


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Navy UCAS Development Roadmap

The Future of Naval Unmanned Aviation



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Examples of UCAS Critical Technologies



The Future of Naval Unmanned Aviation

- **Propulsion Technologies**
 - Low Specific Fuel Consumption and High Specific Thrust Core
 - Integrated power generation
 - Thermal management system
 - Active inlet flow control
- **Command & Control Technologies**
 - GIG interface
 - Autonomous operations
- **Survivability Technologies**
 - Material supportability
 - Sensor integration
- **AV Structure Technologies**
 - Material weight/strength
 - Planform optimization
 - Manufacturing
- **CV Integration Technologies**
 - Deck Handling
 - CV operations

The Technology Maturation Assessment and studies and analyses by Johns Hopkins University APL will better define this list.



UCAS-D Scope

The Future of Naval Unmanned Aviation



- **Objective**
 - **Carrier Suitability of Unmanned, Low Observable Planform UAS**
- **Scope**
 - **Carrier Control Area Operations**
 - **Launch Performance**
 - **Arrested Landing Performance Including Approach, Waveoff and Bolter**
 - **Deck Operations**
 - **Mission Control Segment (MCS) CV Integration**
 - **UCAS interface to CV**
 - » **Primary Flight Control (PriFly), Landing Signal Officer (LSO), and Carrier Air Traffic Control Center (CATCC)**

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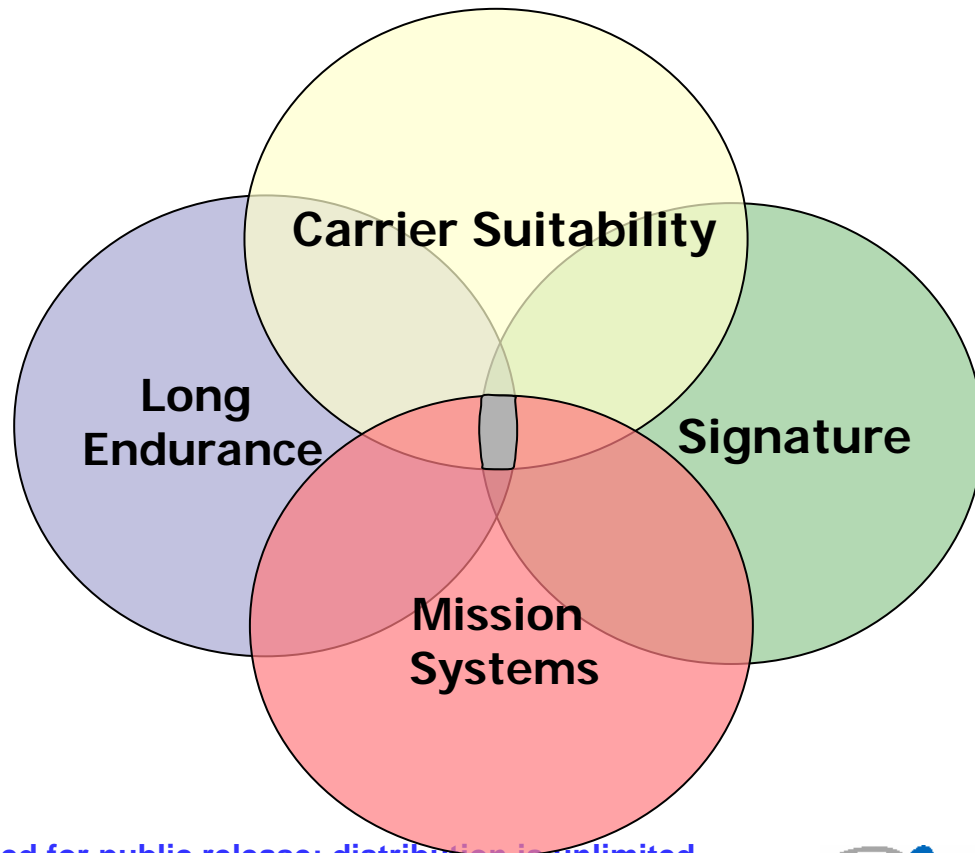
Maturity Challenge

The Future of Naval Unmanned Aviation

Technology Does Not exist today to make all four circles intersect

TRL 6 Definition:

- Representative model or prototype system tested in a relevant environment.
- Represents a major step up in a technology's demonstrated readiness
- Examples include testing a prototype in a high-fidelity laboratory environment or in simulated operational environment



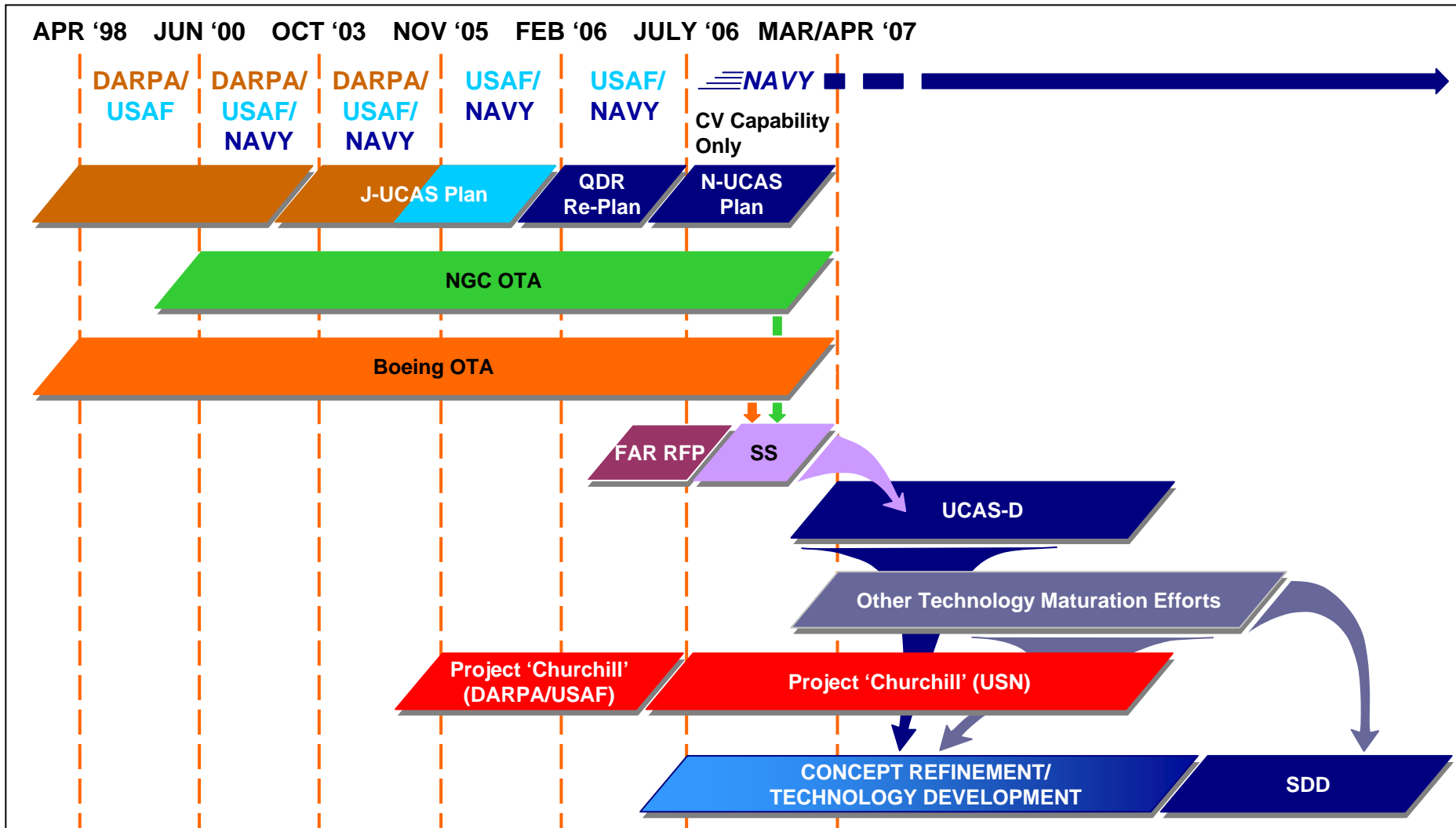
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UCAS Overview & Transition



The Future of Naval Unmanned Aviation



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The Future of Naval Unmanned Aviation

Approved for public release; distribution is unlimited.



Summary

The Future of Naval Unmanned Aviation

- **Planning for UCAS-D Phase on track**
- **Focused on demonstrating the technical feasibility of operating a tailless, unmanned, LO planform aboard a carrier**
- **Potential follow-on efforts will be the result of detailed planning and available resources**



Integrated Joint Battlespace Management

Creating Desired Effects on the Battlefield

RADM Tim Heely
Program Executive Officer
Strike Weapons and Unmanned Aviation
July 25-26, 2006



The Joint Warfighting Arena

Looking ahead...Jointly

- Joint surface Warfare ACTD
- Global Hawk Maritime Demonstration

....But addressing the needs of today

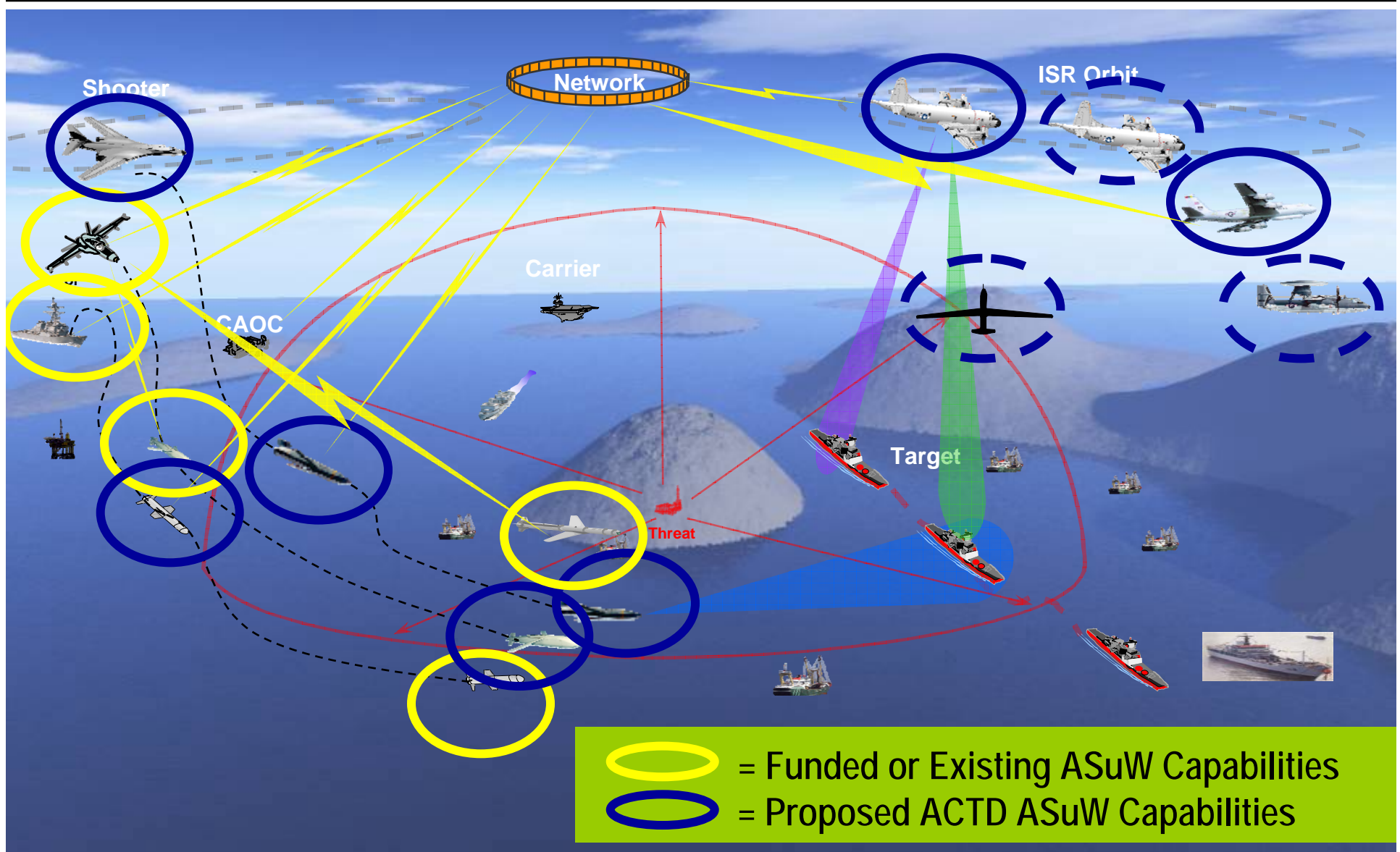
- Scan Eagle



Joint Surface Warfare (SuW) Concept

Multiple Interchangeable ISR Assets

Targeting Multiple Weapons





JSuW ACTD Solution

- Current Service funded SuW efforts
 - JSOW-C Block III (F/A-18E/F Kill Chain)
 - Harpoon III (Aegis Kill Chain)
 - JASSM maritime seeker improvements
 - Weapon Data Link Network (WDLN) ACTD
 - JSTARS ELMM
 - LSRS Maritime Modes

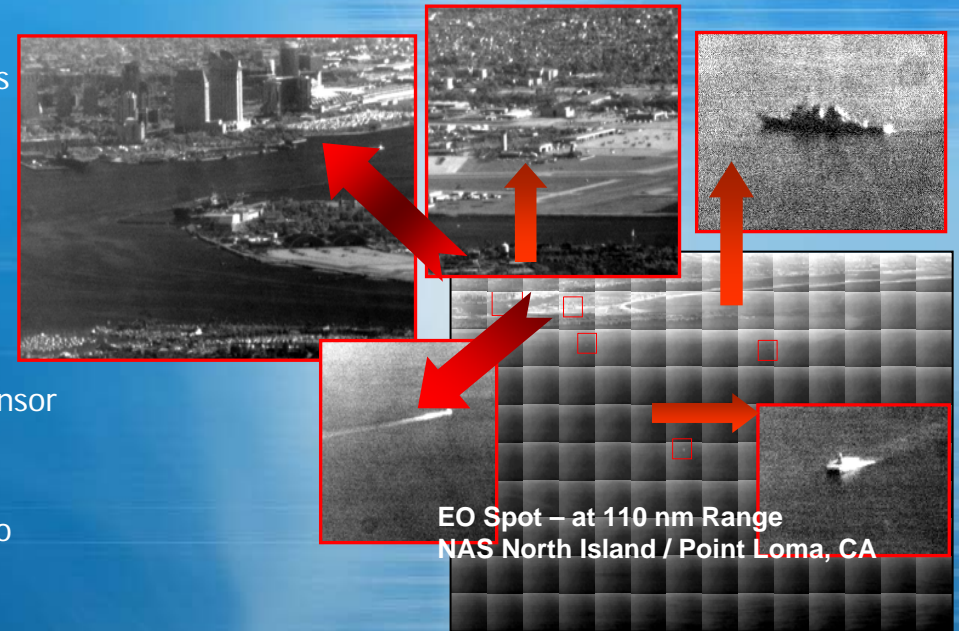
- Proposed ACTD expansion of SuW Kill Chains
 - WDLN messages in more fix, track, target assets: JSTARS, LSRS
 - CONOPS and Tactics, Training and Procedures

Multiple, interchangeable ISR assets targeting for multiple weapons



Global Hawk Maritime Demonstration

- Commonality of AF & USN Global Hawk Systems
 - Simplified Sys Spec and Design for Contractor
 - Common tasks at Prime & Sub-Contractor activities
 - Common Ground Segment Software
 - Reduces SIL throughput
 - Reduces overall cost to the Government
 - Common CM & DM
 - Common Upgrades
 - Common ISS software
 - Discussions ongoing to bring both AF and Navy sensor software into a common build
 - Provides both services with same ISS modes
 - Provides mode flexibility without distraction to service requirements



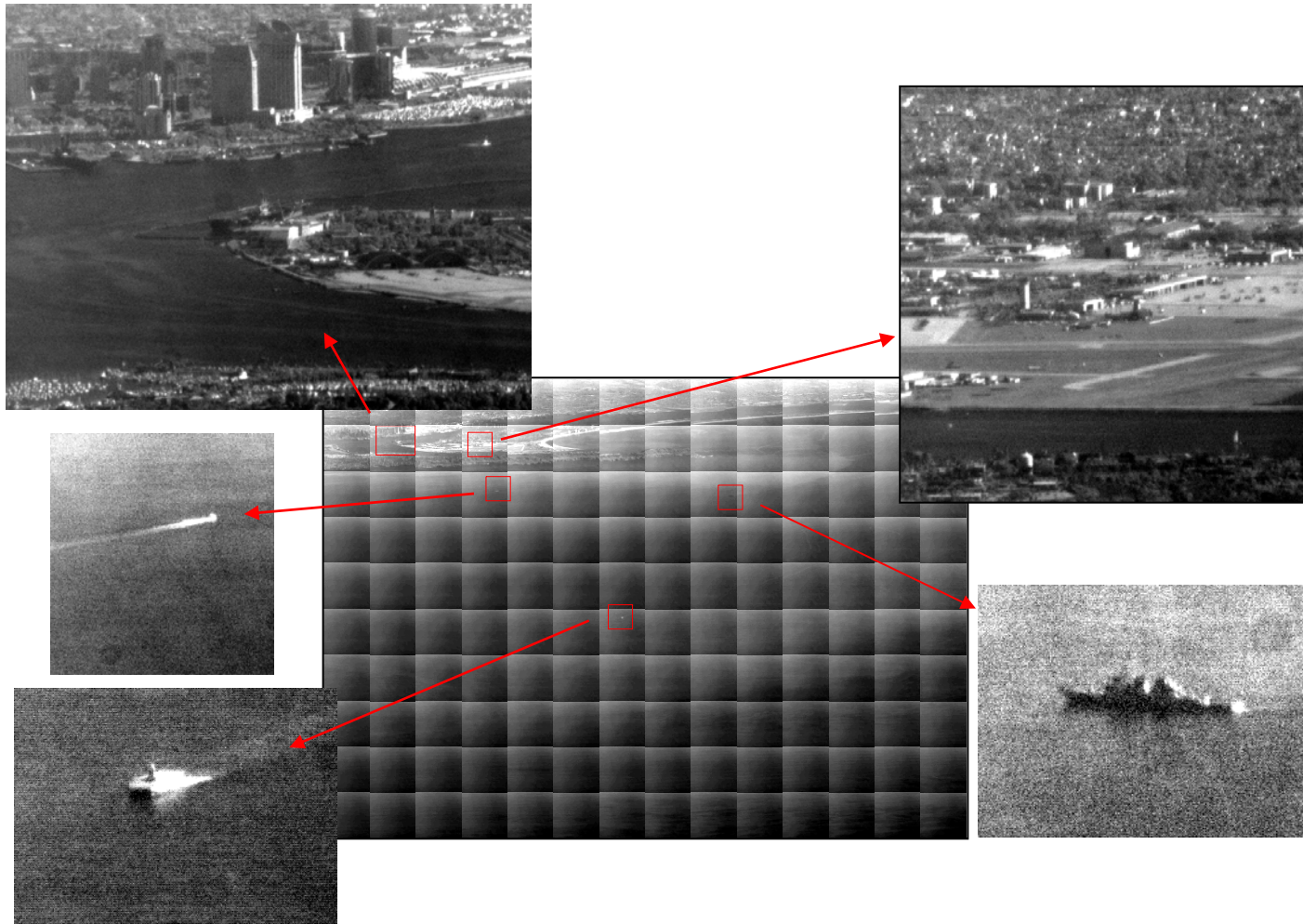


Global Hawk





Global Hawk





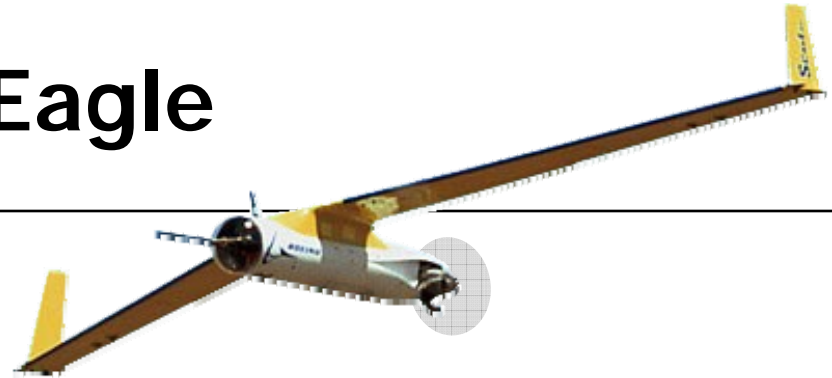
ScanEagle



Launch & Recovery



ScanEagle





Predator





Questions

Predator Precision Weapons Integration and Testing

Precision Strike PEO Forum
July 2006

Overview

- **Predator mission**
- **Predator weapons integration objective**
- **MQ-1B Predator weapons integration and test**
 - Hellfire
 - Stinger
- **MQ-9 Predator B weapons integration and test**
 - GBU-12
 - Hellfire
- **Summary**

Predator Mission

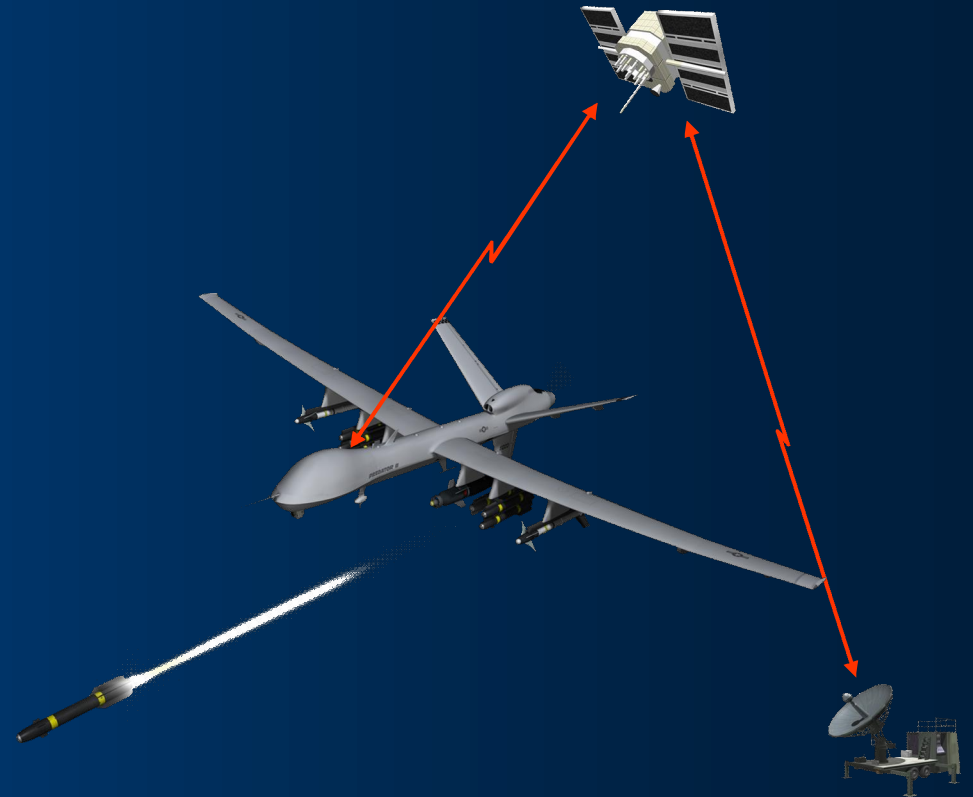


- **Interdiction and armed reconnaissance against critical, perishable targets**
- **Reconnaissance, surveillance and target acquisition in support of the Joint Forces commander**

Mission

Armed

- Is what it has always been
- Weapons coming off airplanes
- But now with precision accuracy



Mission

- **Reconnaissance is now accomplished with:**
 - Persistent airborne platform
 - Day and night streaming video
 - Synthetic aperture radar to image through clouds
 - Near instantaneous distribution world wide

Mission

- **Long Endurance Armed Reconnaissance**
 - 30-50 hr flight times
 - Camera and radar sensors to detect
 - Precision weapons to destroy
- **To make it routine**
 - The pilot/crew had to come out of the airplane
 - The airplane had to be reliable enough to run for 30 – 50 hr per flight
 - A control scheme had to be developed in order to fly the airplane anywhere
 - Unique distribution and reception systems

Ground Control Station (GCS)



- C-Band Line-of-Sight (LOS) data link for take off, landing
- K_u-Band satellite link for missions over the horizon

Multi-Aircraft Control GCS



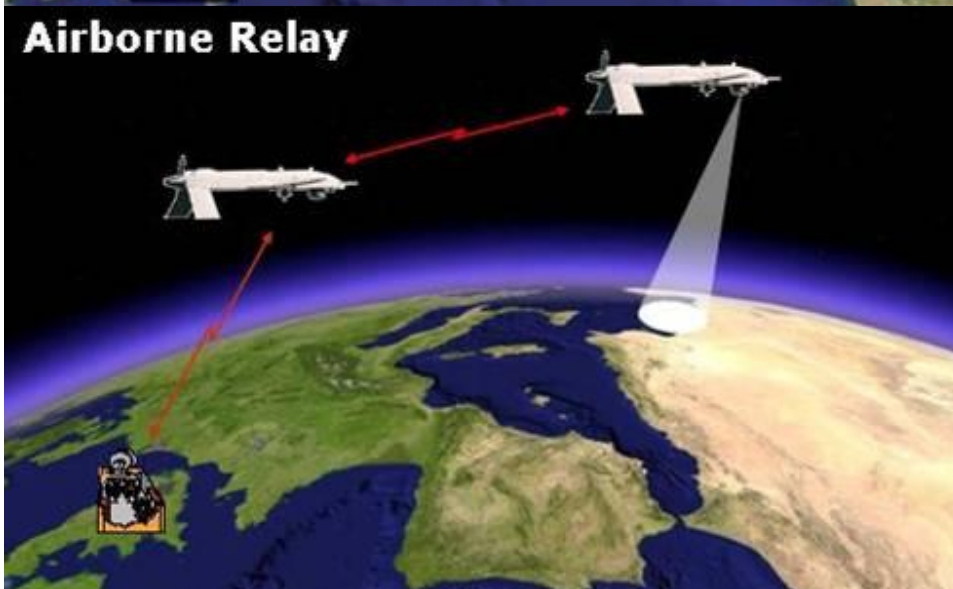
Line of Sight



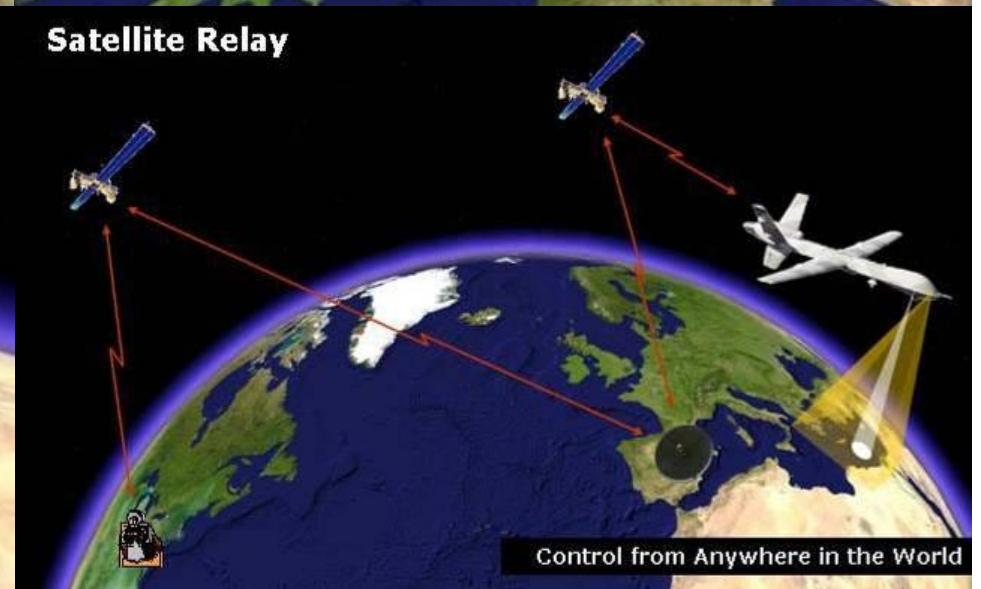
Forward Pass



Airborne Relay



Satellite Relay



Weapons Integration Objective

- **Overall objective of Predator precision weapons integration:**
 - Provide persistent ability to hold time sensitive targets at risk any time, any place
 - Enable compression of end-to-end kill chain

Predator History

- **First flown 1994, deployed to the Balkans 1995**
- **Modified to carry Hellfire 2001**
- **Fleet hours now over 215,000, 2/3 in combat**

Hellfire



HELLFIRE AGM-114C

Weight	98 lb
Length	64 in
Min range	0.5 km
Max range	8.0 km
Velocity	Mach 1.3



M-299 Hellfire Launcher

Weight (4 rail)	145 lb
Weight (2 rail)	96 lb
Standard	14'' lugs
Built-in safe arm switch	

MQ-1 Hellfire Testing



- **Incremental build-up**
 - Ground static live fire
 - Phase 1 flight test: AGM-114C at low altitude
 - Phase 2 flight test: AGM-114K/M at higher operational altitudes
 - AGM-114 P flight test: AGM-114P designed specifically for Predator to allow high off boresight shots

Hellfire Static Ground Launch



Static Ground Launch (Cont.)



Hellfire Phase 2 Flight Test



Operational Mission Using Hellfire



Air-to-Air Stinger Weapon System

- **Accurate and lethal system**
 - Fire and forget missile
 - Two color IR/UV seeker
 - Effective against all known countermeasures
- **Currently fielded on OH-58C, OH-58D, and MH-60 helicopters**



Missile Length	58 in
Missile Diameter	2.75 in
Missile Weight	23 lbs
Missile Speed	Up to Mach 2
Air-to-Air Carriage System	Two per launcher

Predator Stinger Flight Test Program

- **Contract award 25 Sep 02, completed in 56 days**
- **Captive Carry Tests**
 - Functional air-to-ground tests
 - CONOPs development
 - Cessna 206 engagements
 - F-16 engagements
- **Live-Fire Tests**
 - All air-to-ground launches
 - Operations based from China Lake NAWC
 - Varied aircraft communications
 - C-band LOS
 - Ku-band SATCOM
 - Eight missile launches
 - Four Blast Test Vehicles
 - Four Full-up Rounds



Predator Stinger Flight Test Program

- **Captive Carry Test Results**
 - Robust air-to-ground capability
 - Initial air-to-air CONOPs developed
- **Live Fire Demonstration Results**
 - Safe separation from all eight missile shots
 - Four Full-up Rounds
 - Shot 1: Impact between ground targets
 - Shot 2: Timed self-destruct prior to target
 - Shot 3: Timed self-destruct prior to target
 - Shot 4: No self-destruct – potential missile failure
 - Set world record for highest Stinger Missile launch (20,000' MSL)



Stinger Operational Use



MQ-9 Predator B System Description



- **Mission:**
 - Hunter-Killer: Prosecute critical emerging time sensitive targets as a radar-based attack asset with organic hard-kill capability
 - ISR and target acquisition
- **History**
 - First flown 2001
 - Currently integrating GBU-12, GBU-38 and Hellfire under the MQ-9 System Development and Demonstration (SDD) program

MQ-9 Predator B System Description (cont)



	Predator	Predator B	Factor
GTOW	2,250 lb (1022 kg)	10,500 lb (4772 kg)	4.6
HP	105	900	8.6
Maximum Altitude	25,000	50,000+	2
Maximum Speed	120 KTAS	240 KTAS	2
Fuel	600 lb	4,000 lb	6.6
Payload Nose	450 lb (204 kg)	800 lb (363 kg)	1.8
Payload Wing	250 lb (113 kg)	3,000 lb (1363 kg)	12
Endurance	40 hr	30 hr+	.75

MTS-B EO/IR Payload



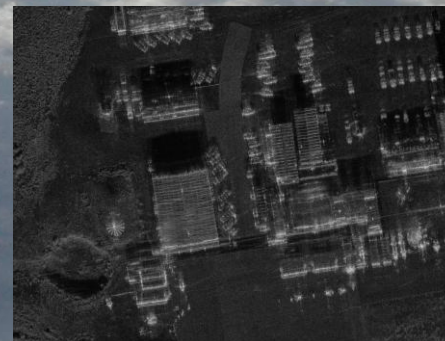
Lynx SAR



1m resolution



0.3m resolution



Dwell spot 0.1m

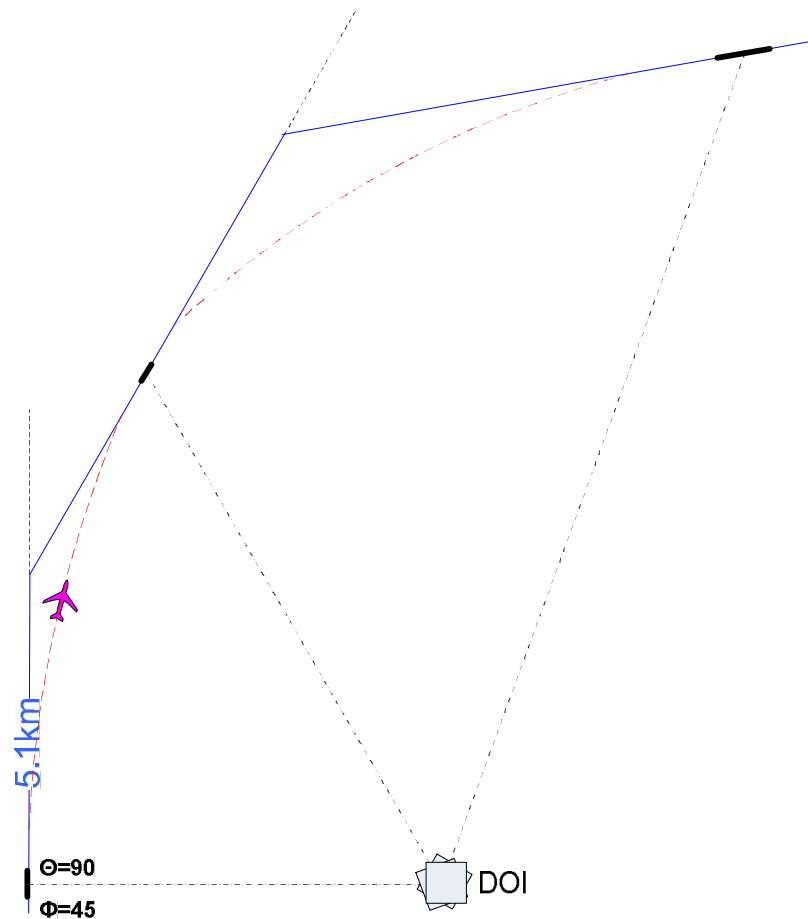


Drill-down zoom sequence
with SAR and EO-imagery

Lynx 3D Targeting

- Spot images collected at three (3) points
- Ability to cue EO/IR sensor or pass target coordinates to weapons

Example 30 Kft Flight Path



GBU-12 Munition

- **GBU-12 Munition**
 - 500 lb class weapon
 - Part of the Paveway II family of munitions
 - Semi-active laser guidance
 - Bang-bang autopilot control
 - No electrical connection to the host aircraft
- **Currently in service with the US Air Force and US Navy**



Munition Length	129 in
Munition Diameter	11 in
Munition Weight	609 lb
Fuze	FMU-81
Booster	FZU-2

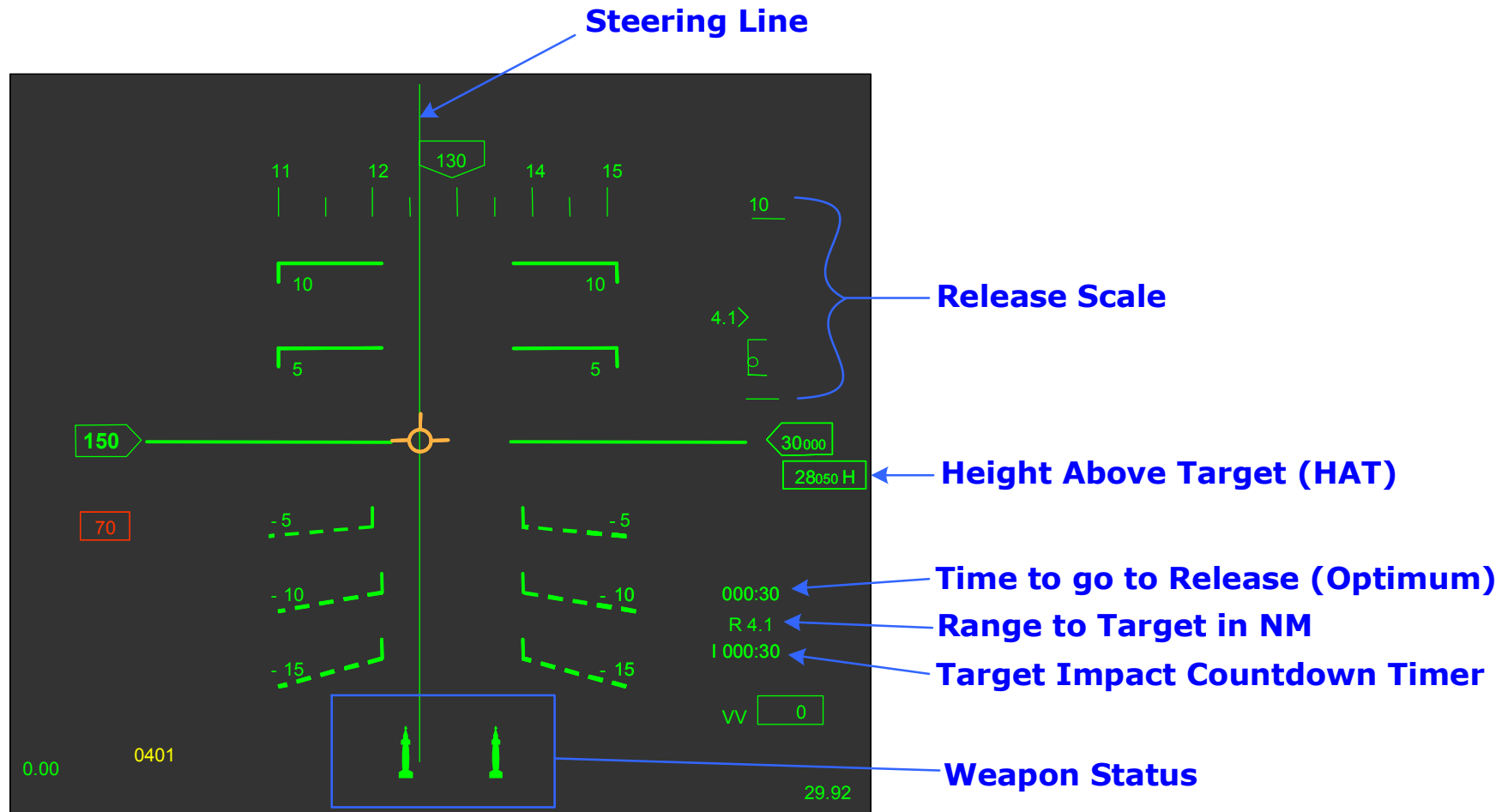
BRU-15 Bomb Rack

- **BRU-15/A Bomb Rack**
 - Electro-mechanical gravity rack
 - No pyrotechnics or pneumatic actuation
 - Release via 28 v electrical impulse
- **Currently fielded on the P-3B and P-3C Orion aircraft**



Rack Length	23.5 in
Rack Height	5.4 in
Rack Weight	16 lb
Standard Suspension	14 in
Aero 1A Adapter Suspension	30 in

Human Machine Interface



GBU-12 and Hellfire Test Program

- **Standard test program for weapons integration**
 - Ground:
 - Ground vibration tests
 - Drop test
 - System Integration Lab (SIL) test
 - Flight
 - Separation tests
 - Handling qualities
 - Guided inert drops/launches
 - Guided live drops/launches



GBU-12 Separation Testing



GBU-12 Live Drop



MQ-9 With Hellfire and GBU-12



MQ-9 Hellfire Flight Test



Summary

- **MQ-1 and MQ-9 are well suited for precision weapons delivery**
 - Designs allow easy mission role expansion
 - Man-in-the-loop allows for positive control of weapons employment
 - Satellite control and persistence allows weapons to be in the right place at the right time to engage time sensitive targets
- **MQ-1 continues to be a vital weapon systems in the GWOT**
- **MQ-9 will bring significant additional capability to the fight**





Unmanned Combat Air Systems

26 July 2006

Dyke D. Weatherington
OUSD(AT&L)/PSA/Air Warfare



2006 QDR Guidance

- The 2006 Quadrennial Defense Review Report emphasizes the importance of Unmanned Aircraft Systems
 - Department will also increase procurement of unmanned aerial vehicles to increase persistent surveillance, nearly doubling today's capacity
 - Approximately 45% of the future long-range strike force will be unmanned
 - Establish a SOF unmanned aircraft systems squadron
 - Maritime aviation will include unmanned aircraft for both surveillance and strike
 - Restructure the Joint Unmanned Combat Air System (J-UCAS) program and develop an unmanned longer-range carrier-based aircraft capable of being air-refueled to provide greater standoff capability,
 - Increase investment in unmanned aerial vehicles to provide more flexible capabilities to identify and track moving targets in denied areas
 - Nearly double UAV coverage capacity by accelerating the acquisition of Predator UAVs and Global Hawk



Persistent Surveillance

- The Department will also increase procurement of unmanned aerial vehicles to increase persistent surveillance, nearly doubling today's capacity. It also will begin development of the next generation long-range strike systems, accelerating projected initial operational capability by almost two decades.

Page-6

- Nearly double UAV coverage capacity by accelerating the acquisition of Predator UAVs and Global Hawk. Page-46



Unmanned Aircraft (UA) 2006

Theater & Tactical (>10lbs)

• Buster	20
• Pioneer	34
• Shadow 200	140
• Neptune	15
• Tern	15
• Mako	14
• Tigershark	6
• SnowGoose	25
• Hunter	32
• I-Gnat	4
• Predator	70
• Predator B	6
• Global Hawk(GH) - ACTD	4
• Global Hawk - Prod	5
• <u>GH Maritime Demo</u>	<u>2</u>
• Sub-total	392

309% Increase from 2002

Small (<10lbs)

• Pointer	126
• Raven	1776
• Dragon Eye	402
• Desert Hawk	126
• BATCAM	54
• <u>Swift</u>	<u>212</u>
• Sub-total	2570

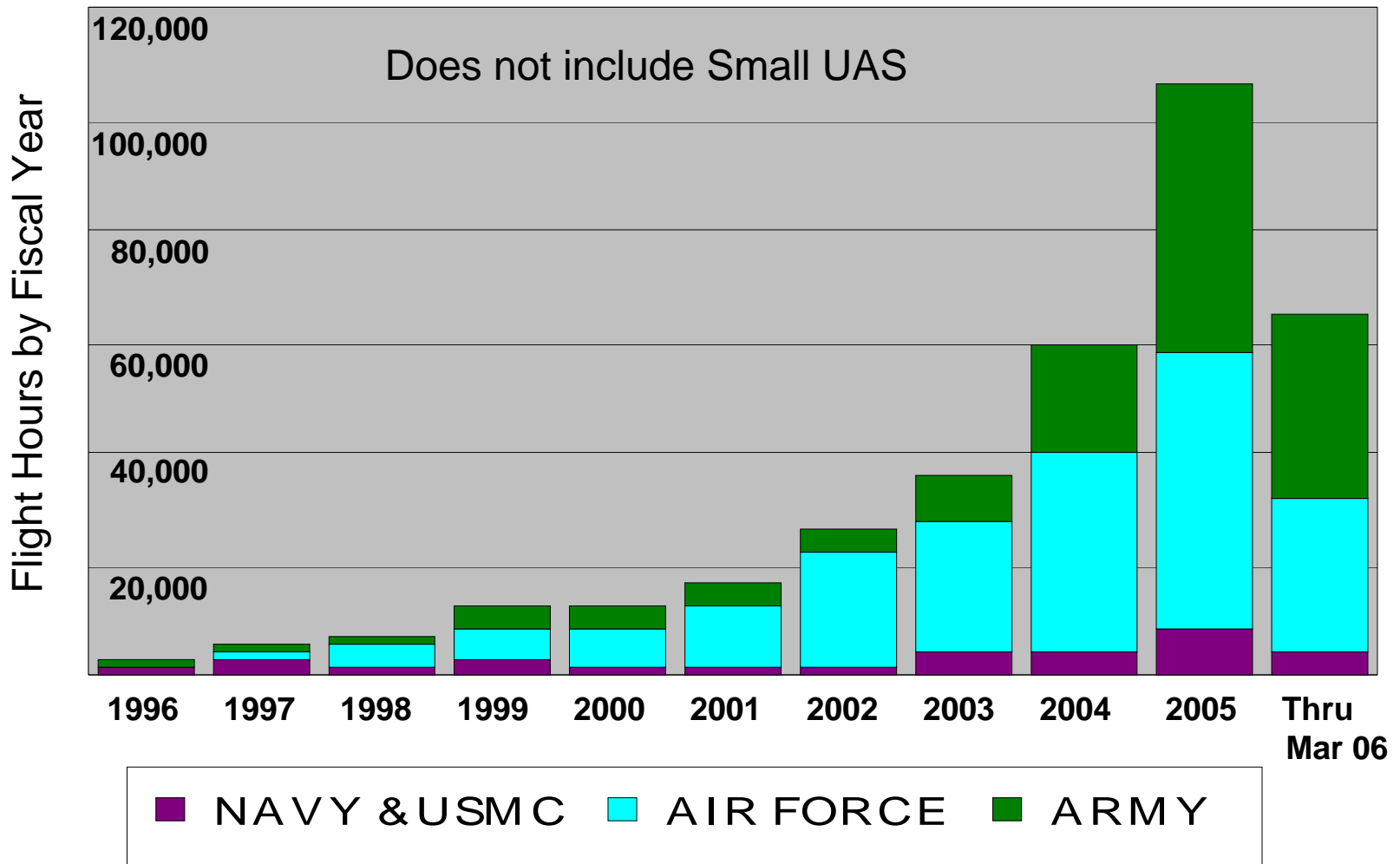
1,773% Increase from 2002

2002	167 Aircraft	\$ 763M
2004	727 Aircraft	\$1,631M
2006	2,962 Aircraft	\$1,627M

Total R&D and Procurement costs per year

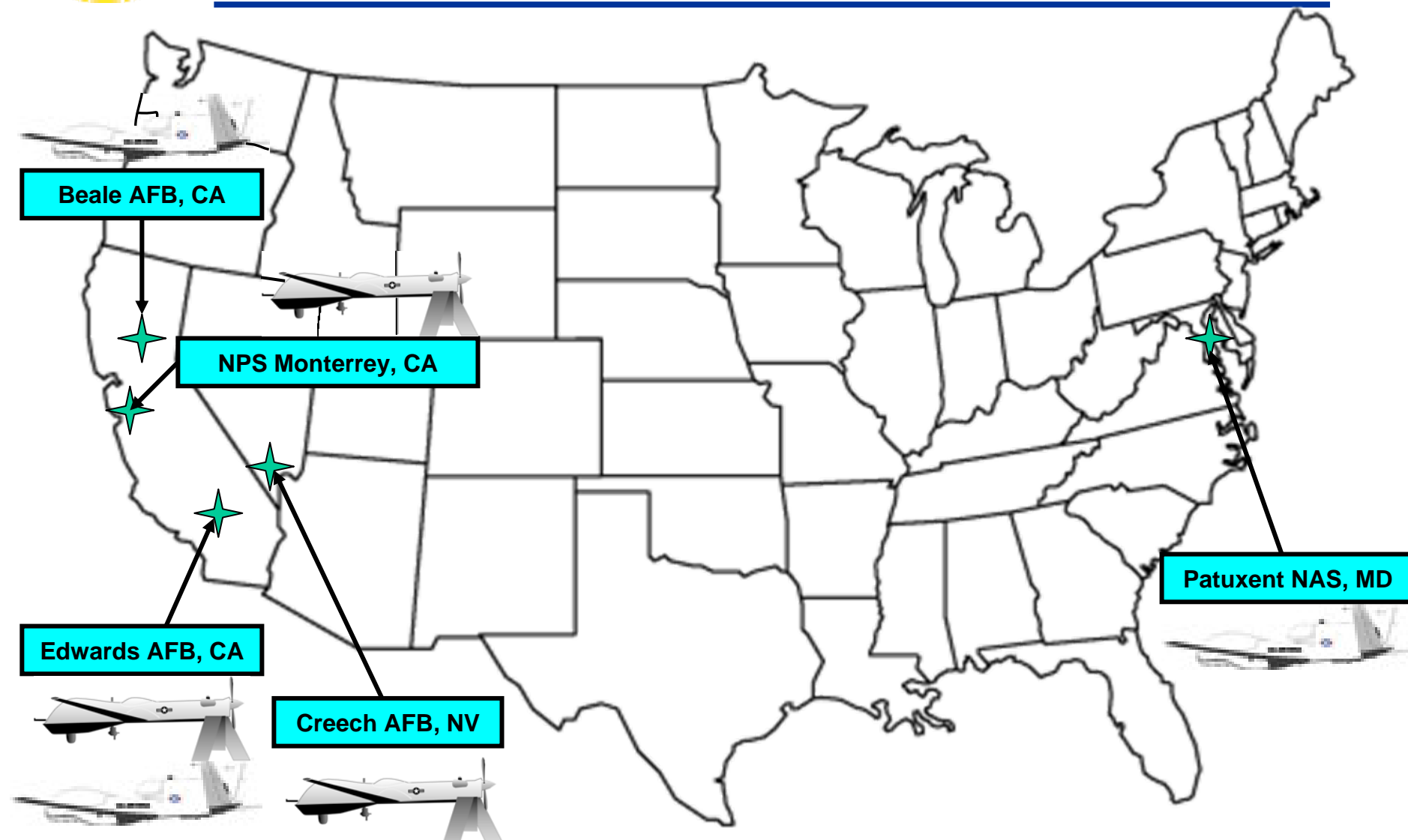


DoD UAS Flight Hours





Current Predator & Global Hawk Operations





Persistent Surveillance



RQ-4 Global Hawk

Attributes:

- Ceiling – 65,000 ft
- Endurance – 32 hours
- Radius – 5,400 nm
- Sensors – EO/IR, SIGINT, SAR/MTI
- Payload – 1,950 lbs
- Data Link (s) – BLOS (SATCOM)/ LOS



MQ-1 Predator

Attributes:

- Ceiling – 25,000 ft
- Endurance – 14 hours (armed)
24 hours (unarmed)
- Radius – 500 nm
- Sensors – EO/IR, SAR
- Payload – 450 lbs
- Data Link (s) – BLOS/ LOS



Future Long-Range Strike

- The Air Force has set a goal of increasing its long-range strike capabilities by 50% and the penetrating component of long-range strike by a factor of five by 2025. Approximately 45% of the future long-range strike force will be unmanned. Page-46



Air Force Long Range Strike Way Ahead

3-Phased Approach

- **Phase 1 – Continues modernization of legacy bombers to upgrade combat effectiveness**
- **Phase 2 (Next Generation Long Range Strike) – Leverages near-term technologies to start development of long range strike capability to augment current fleet**
 - **Technology maturity a key consideration to meet QDR-directed 2018 IOC**
 - **Analysis of Alternatives being conducted, results due Spring 2007**
- **Phase 3 – Cutting edge *producible* technology in the 2035+ timeframe**
 - **Directed energy, hypersonics, exo-atmospheric**
 - **Speed, range, accuracy, connectivity & survivability improvements**



Air Force Long Range Strike (Phase 2) AoA Desired Capabilities

- **Long-range** – Global from CONUS or forward operating bases
- **Persistent** – 24/7 capability in anti-access environment
- **Responsive** – Respond globally within hours to minutes
- **Flexible, precise weapons payload** – Mixed load, nuclear capable
- **Highly survivable – Self-defending** – reduces support
 - Low observable, standoff weapons, speed, altitude
 - Manned, unmanned, or optionally manned
- **Global situational awareness**
 - Robust, fused sensor suites
- **Real-time, robust beyond line of site connectivity** – Fully netted
- **Autonomous operations** – Onboard sensors, offensive, defensive, non-traditional ISR
- **Flexibility /adaptability** – easily incorporate new capabilities, open architecture – “plug and play”



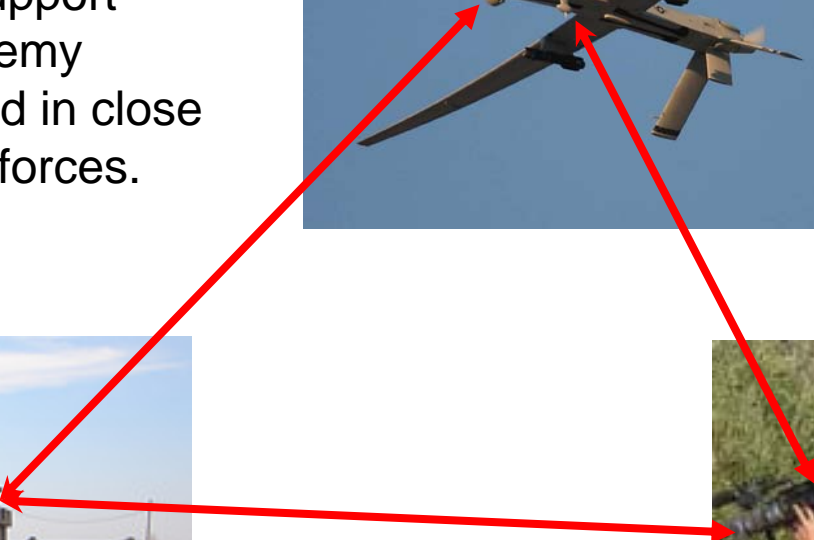
Joint Tactical Air Control

- Expand the Air Force Joint Tactical Air Control program by jointly training personnel for air/ground operations and use of Unmanned Aerial Vehicles.
- Page-43



Tactical Air Control Party

A TACP is generally a two-airman team, working in an Army ground unit and directing close air support firepower toward enemy targets on the ground in close proximity to friendly forces.





Special Operations UAS Squadron

- The Air Force will establish an Unmanned Aerial Vehicle Squadron under U.S. SOCOM. Page-5
- Establish a SOF unmanned aerial vehicle squadron to provide organic capabilities to locate and target enemy capabilities in denied or contested areas. Page-45





Special Operations UAS Squadron

The Air Force is currently standing up a special operations Predator UAV squadron at Creech Air Force Base, NV. The squadron will initially consist of 24 MQ-1 aircraft but could eventually add the larger MQ-9 Predator B when the aircraft completes development. The Air Force has not announced a specific timetable for the completion of the stand up of the AFSOC Predator squadron.





MQ-9 Predator B





Naval Aviation

- Maritime aviation will include unmanned aircraft for both surveillance and strike. Page-45
- Restructure the Joint Unmanned Combat Air System (J-UCAS) program and develop an unmanned longer-range carrier-based aircraft capable of being air-refueled to provide greater standoff capability, to expand payload and launch options, and to increase naval reach and persistence. Page-46



Navy Unmanned Combat Air System



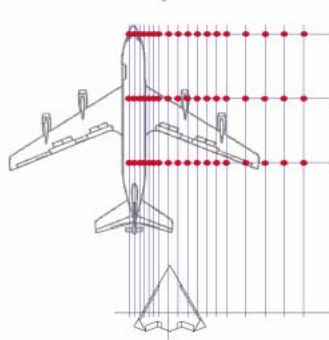
Restructure the Joint Unmanned Combat Air System (J-UCAS) program and develop an unmanned longer-range carrier-based aircraft capable of being air-refueled to provide greater standoff capability, to expand payload and launch options, and to increase naval reach and persistence.

	<u>FY07</u>	<u>FY08</u>	<u>FY09</u>	<u>FY10</u>	<u>FY11</u>	<u>FY07-11</u>
RDT&E-Navy (\$M)	+239	+310	+369.4	+491.1	+421.1	+1,830.5

CAT/TRAP Demonstration planned for FY11



Automated Aerial Refueling



Goal: Develop and Flight Demonstrate Initial AAR Capability

Initial User/TAD: J-UCAS, FY07

Technology Challenges:

- Rendezvous
- UAS Operations near tanker
 - Precise relative position
 - Collision avoidance
- C2: MCS supervised, Boomer breakaway
- Systems integration

Strong ACC & AMC participation in effort - Includes desire to minimize impact to existing tanker fleet and con-ops



Reserve Component

- The Air Force is optimizing Reserve Component personnel for new missions that can be performed from the United States, including unmanned aerial vehicle (UAV) operations and ISR reach-back, leveraging the core competencies of the reserves while reducing stress on the force. Page-45





Reserve Component

- Grand Forks initially is scheduled to receive Predators in 2009 and Global Hawks in 2010, North Dakota Senator Kent Conrad
- The details of the Grand Forks and Fargo missions were embedded in the Air Force's Total Force Integration program, which lays the ground rules for military strategies and acquisitions. Under this program, the North Dakota Air National Guard's 119th Wing was assigned two missions at Hector International Airport. Those missions are flying an unidentified joint cargo aircraft and operating a Predator UAV ground control station.
- The Guard will create a new maintenance unit at Grand Forks Air Force Base that will support Predator launch and recovery operations. The new maintenance squadron also may be asked to support Global Hawk UAV operations once those aircraft arrive on base, Senator Conrad said.

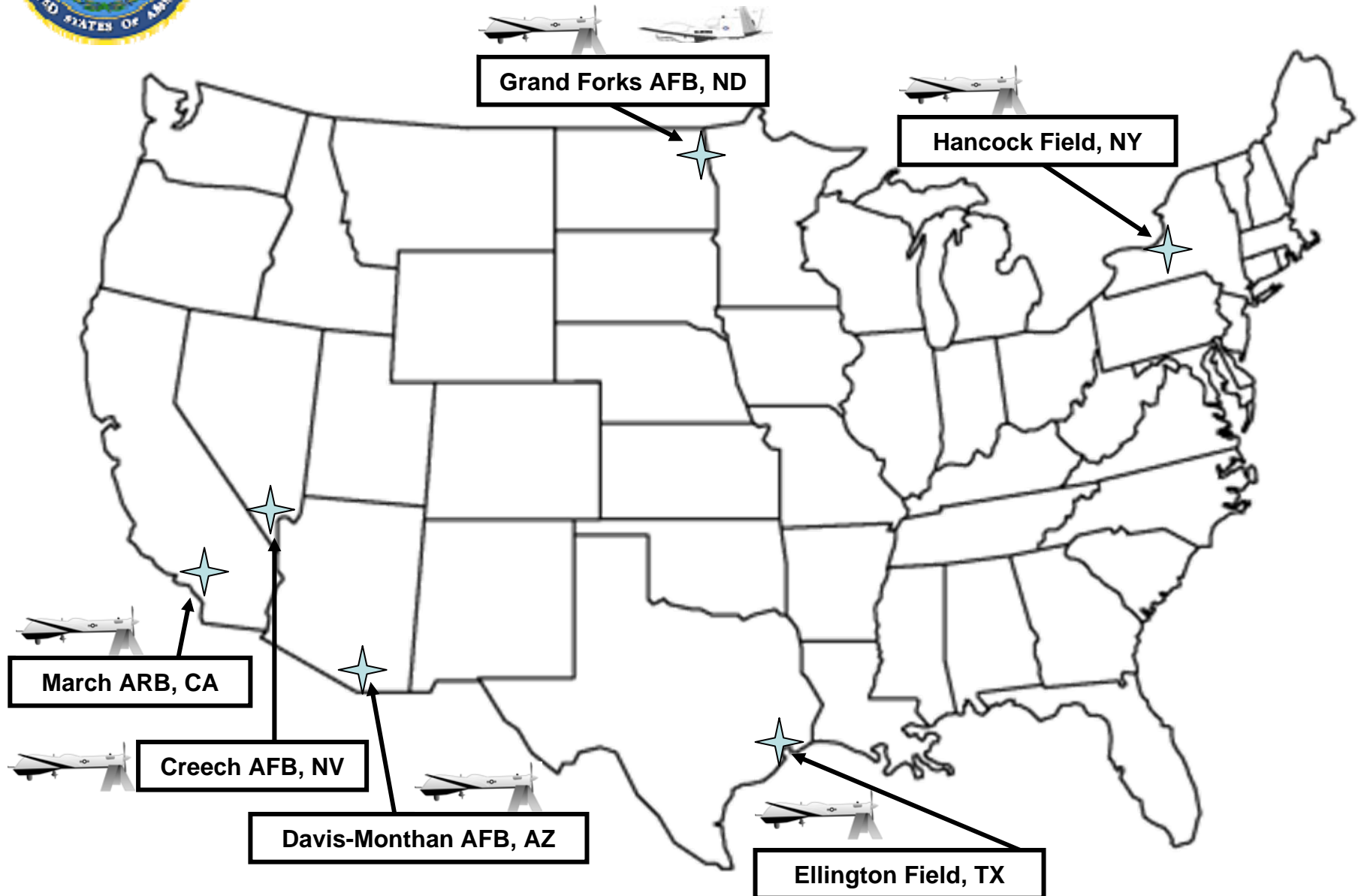


Reserve Component

- **Air National Guards units will conduct Predator unmanned aircraft systems missions in a reachback capacity over long distances from their home states.**
- **Air Force Reserve members will participate in all mission areas at the Air Warfare Center at Nellis Air Force Base, Nev. The first new reserve-component mission will be Predator unmanned aircraft systems missions.**
- **5 Predator Squadrons**
 - Arizona – Davis-Monthan/ Fort Huachuca
 - California – March ARB
 - New York – Hancock Field Syracuse
 - North Dakota – Fargo/Grand Forks
 - Texas – Ellington Field
- **Global Hawk Units**
 - North Dakota - Grand Forks
- **United States Air Force Warfare Center**
 - Reserve & Guard augmentation



Proposed Guard and Reserve Predator and Global Hawk Locations



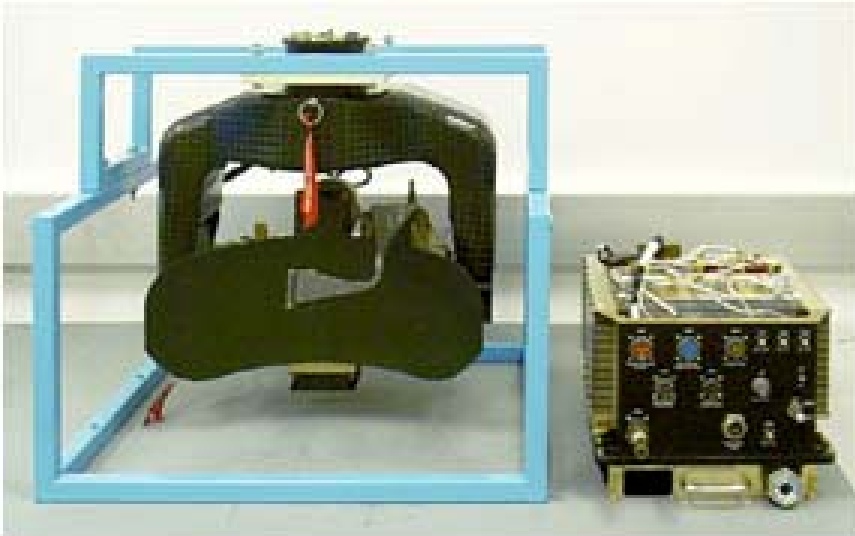


Moving Targets

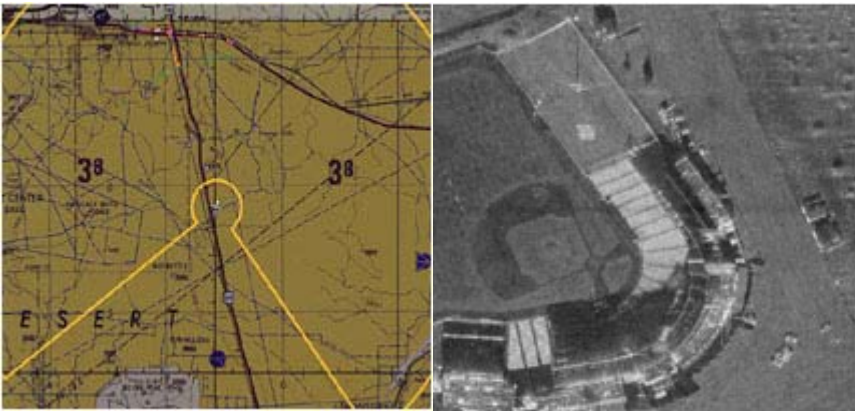
- Increase investment in unmanned aerial vehicles to provide more flexible capabilities to identify and track moving targets in denied areas. Page-57



Lynx II Synthetic Aperture Radar/Ground Moving Target Indicator (SAR/GMTI)



- **Mission**
The Lynx II SAR/GMTI is a multi-function radar that operates in Synthetic Aperture Radar (SAR) and Ground Moving Target Indicator (GMTI) modes. High-resolution SAR and GMTI data is processed on-board and is data-linked to a Ground Station for exploitation.
- **Description**
The *Lynx II* consists of a Radar Electronics Assembly (REA) and an Antenna/Gimbal Assembly. SAR modes operate in 0.1 m to 3.0 m resolution. In the GMTI mode, the radar detects moving targets at speeds of 10-70 kph and overlays their locations on a digital map. The *Lynx II* is slated for production in FY07 and is sized for operations on the UA Class IV, ER/MP and Hunter UAVs.
- **Applications**
 - All-condition RSTA of moving and stationary targets
 - Battle Damage Assessment (BDA)
 - Wide area surveillance
 - Brigade/Division intelligence operations
 - Multi-mode cueing





Office of the Secretary of Defense Unmanned Systems Roadmap 2007-2032

- **Focus**

- Interoperability of air, ground, and sea systems
- Remains on customer, technology and industry

- **Adds**

- Unmanned Ground Systems
- Unmanned Surface Systems
- Unmanned Underwater Systems

- **New Format**

- Long term plan is to publish an integrated Unmanned Systems Roadmap in 2009
- The goal is for the 2009 Road map to influence the FY 2010 POM





Unmanned Systems Roadmap, 2007

Very Rough Format Straw Man

- Executive Summary
 - Chapter 1 – Introduction
 - Chapter 2 – Strategic Planning, Policy, Guidance, & Organization
 - Chapter 3 – Capabilities
 - Chapter 4 – Joint Mission Areas
 - Chapter 5 – Technology Application (appendices in current version of the roadmap)
 - Chapter 6 – Experimentation and Test
 - Chapter 7 – Roadmap –
 programs/capabilities/timeline
 - Annex A – Unmanned Aircraft Systems
 - Annex B – Unmanned Ground Systems
 - Annex C – Unmanned Sea Systems
 - Annex D – Standards Listing
-
- Separate volume with detailed appendices...?
-
- Targeting completion Fall FY07





Questions?

Headquarters Air Combat Command

ACC/C2ISR Delivering Desired Effects on the Battlefield



Col Tom Wozniak
ACC/A8C
25 July 2006

This Briefing is:
UNCLASSIFIED

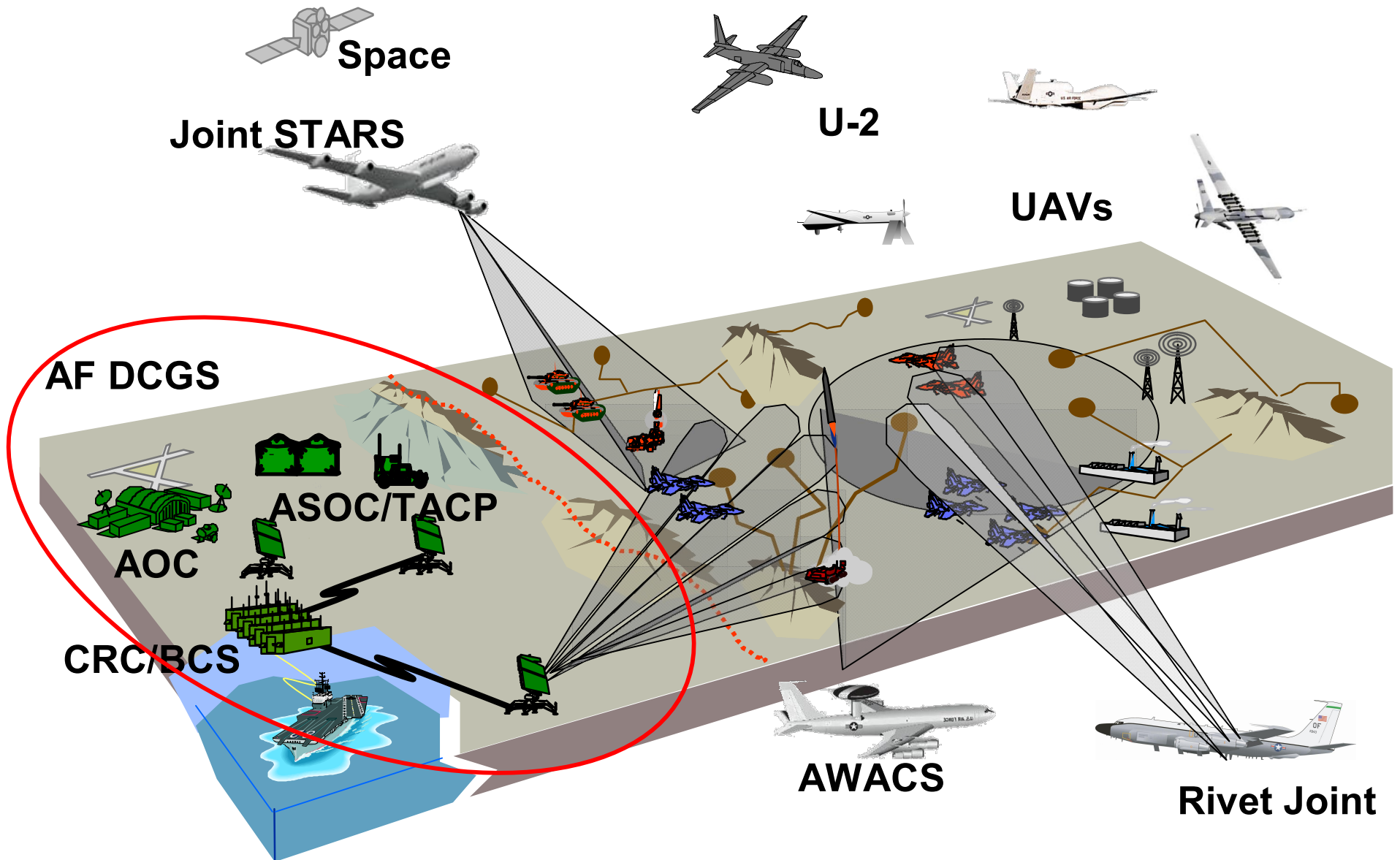


Overview

- **Tactical Level Programs**
 - TTNT, TACP, ICAN
- **Operational Level Programs**
 - NCCT, BACN, AMSTE
- **C2ISR Integration**
 - Future, HMI
- **Force Structure Challenge**

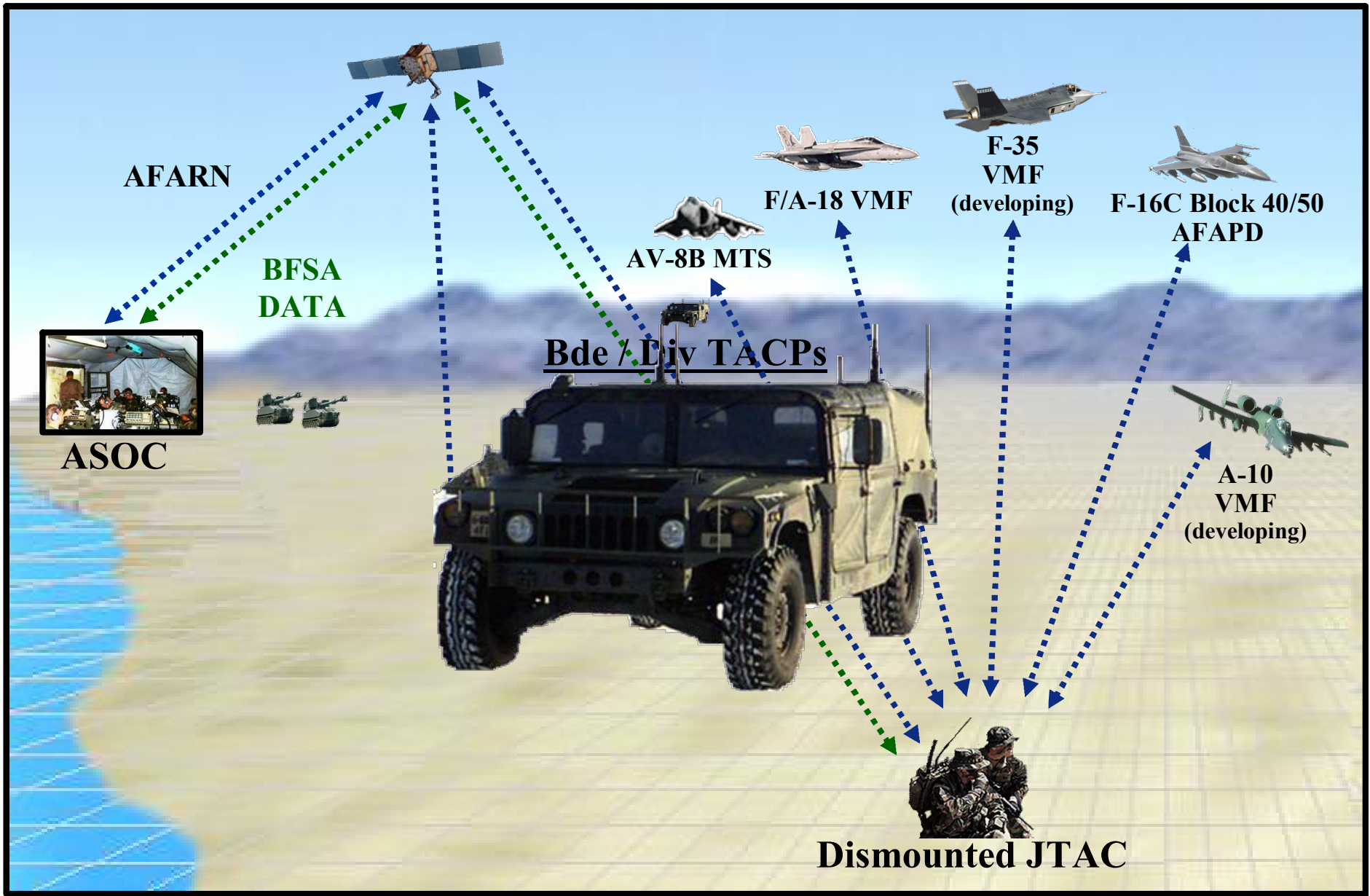


Tactical Level Programs





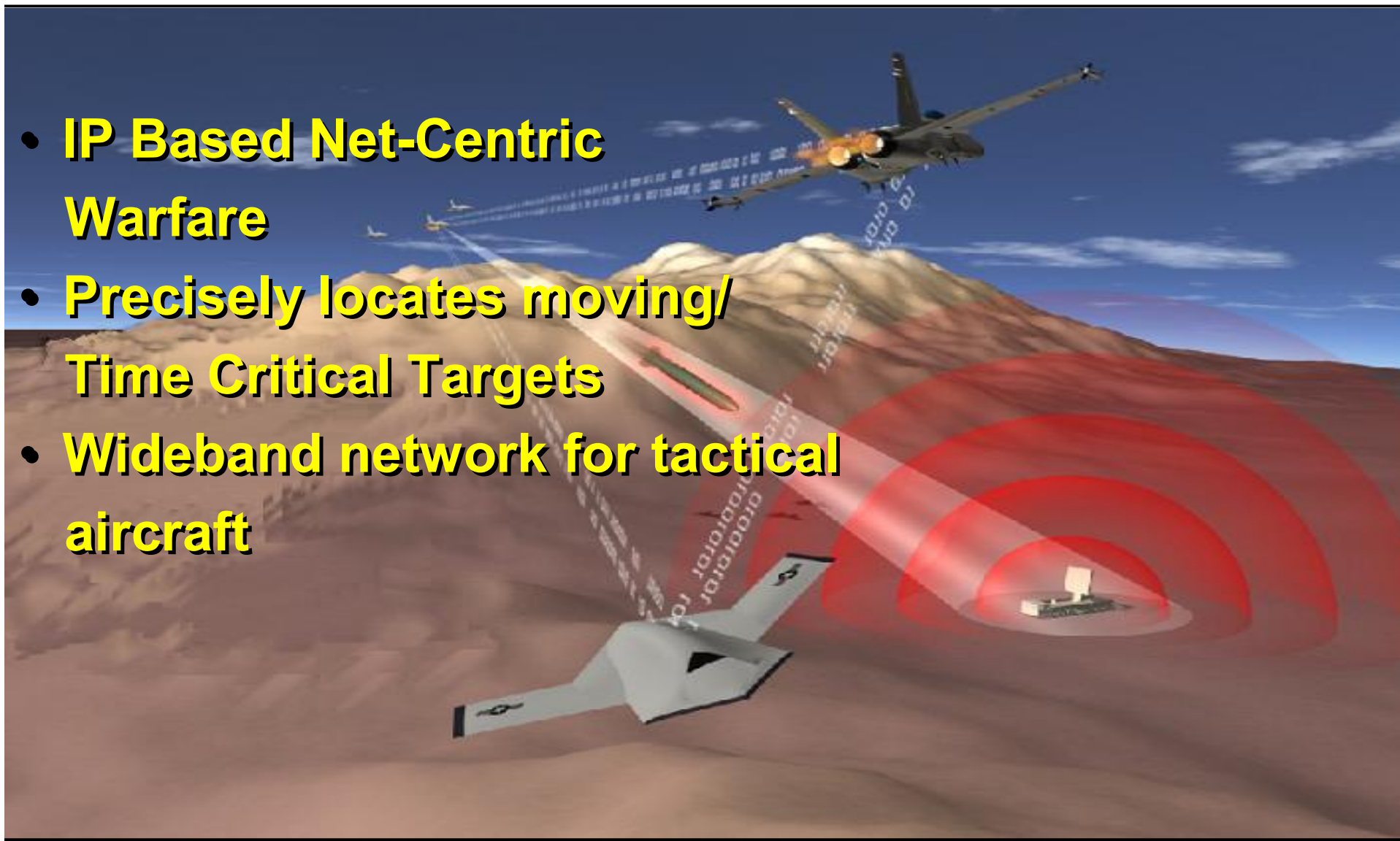
TACP-CASS S/W v1.2 – Fielded





Tactical Targeting Network Technology (TTNT)

- **IP Based Net-Centric Warfare**
- **Precisely locates moving/ Time Critical Targets**
- **Wideband network for tactical aircraft**





TTNT for Airborne Networking in JEFX-06

Terminal Asset List



**BACH
WB-57**



Wideband



B-52



E-8 Joint Stars



E-3 AWACS



Raider / Swipe vehicle



707-Paul Revere



E-2C X-HAWK



F-15 E1



Black Mountain

Wideband

Hard Wired



CAOC-N



F/A-18 F1

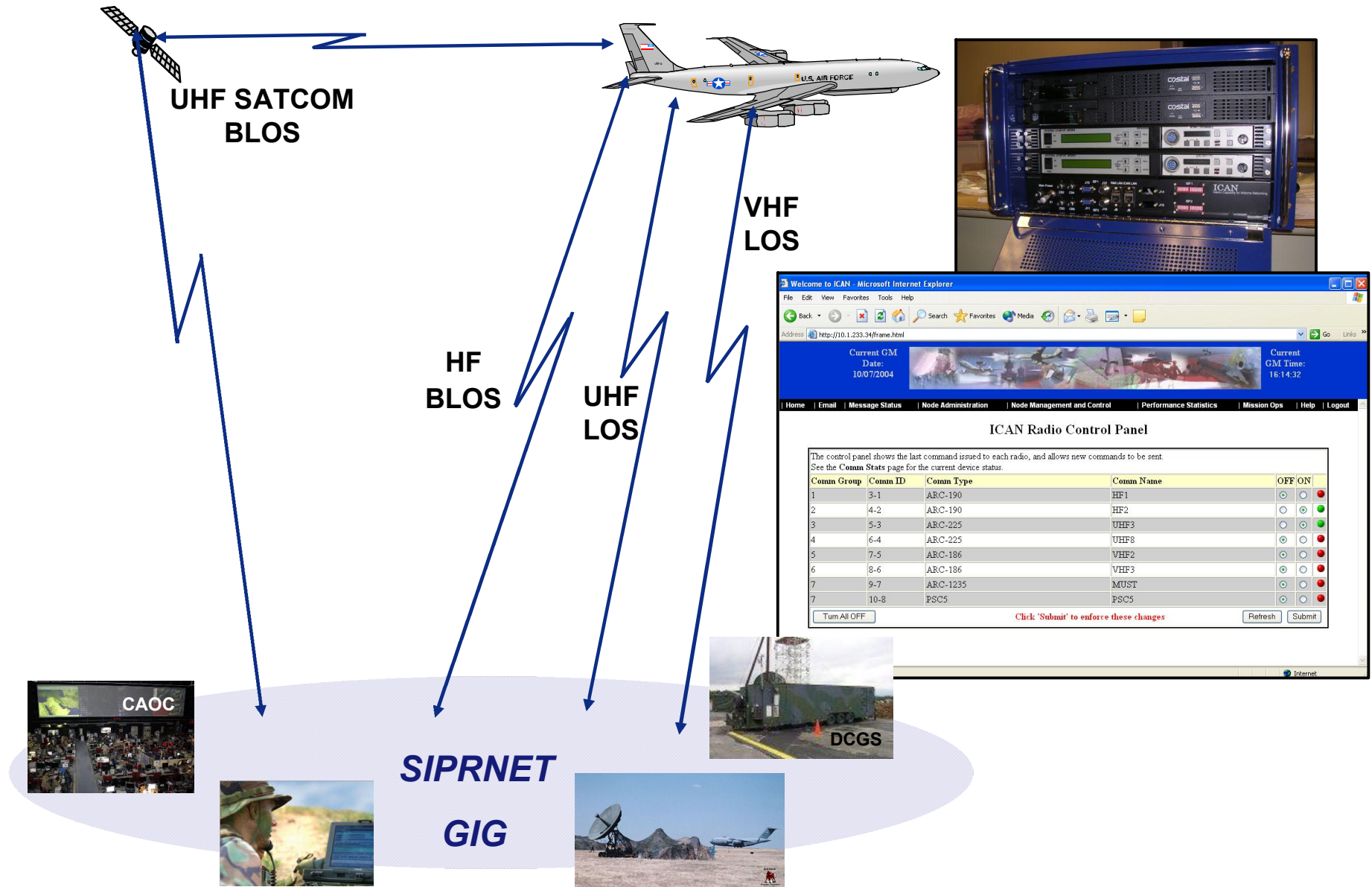
JEFX-06 Airborne Networking (AN) Applications

**Blue Force Situational Awareness
Collaborative Targeting
Dynamic Air Tasking Order
Surf Combat Web for Archived Imagery**

**Non-Traditional ISR - Targeting Pod Video
Voice over IP
Collaborative Tools - Text Chat
Graphical Weather to the Cockpit**

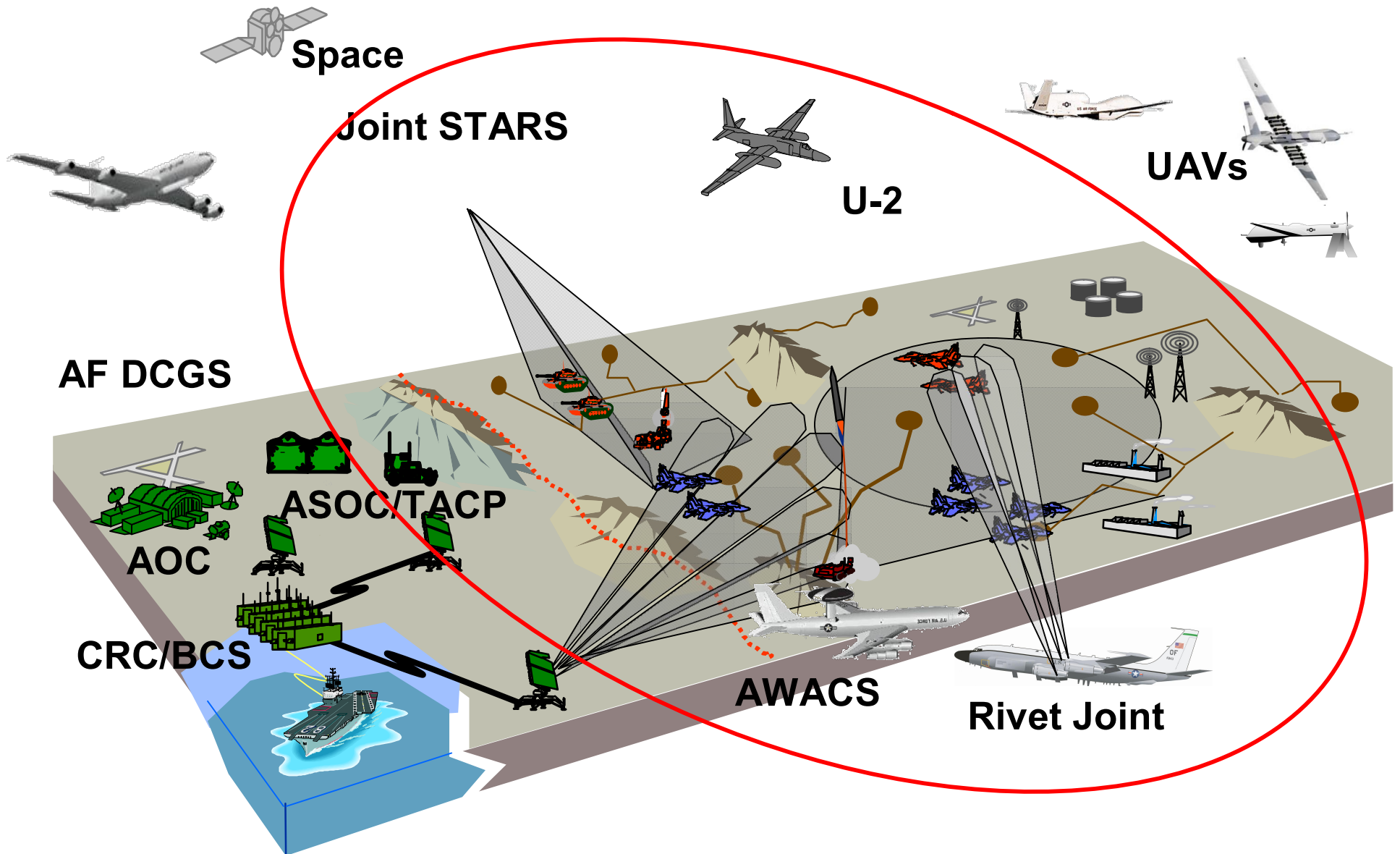


ICAN Deployment CONOPS



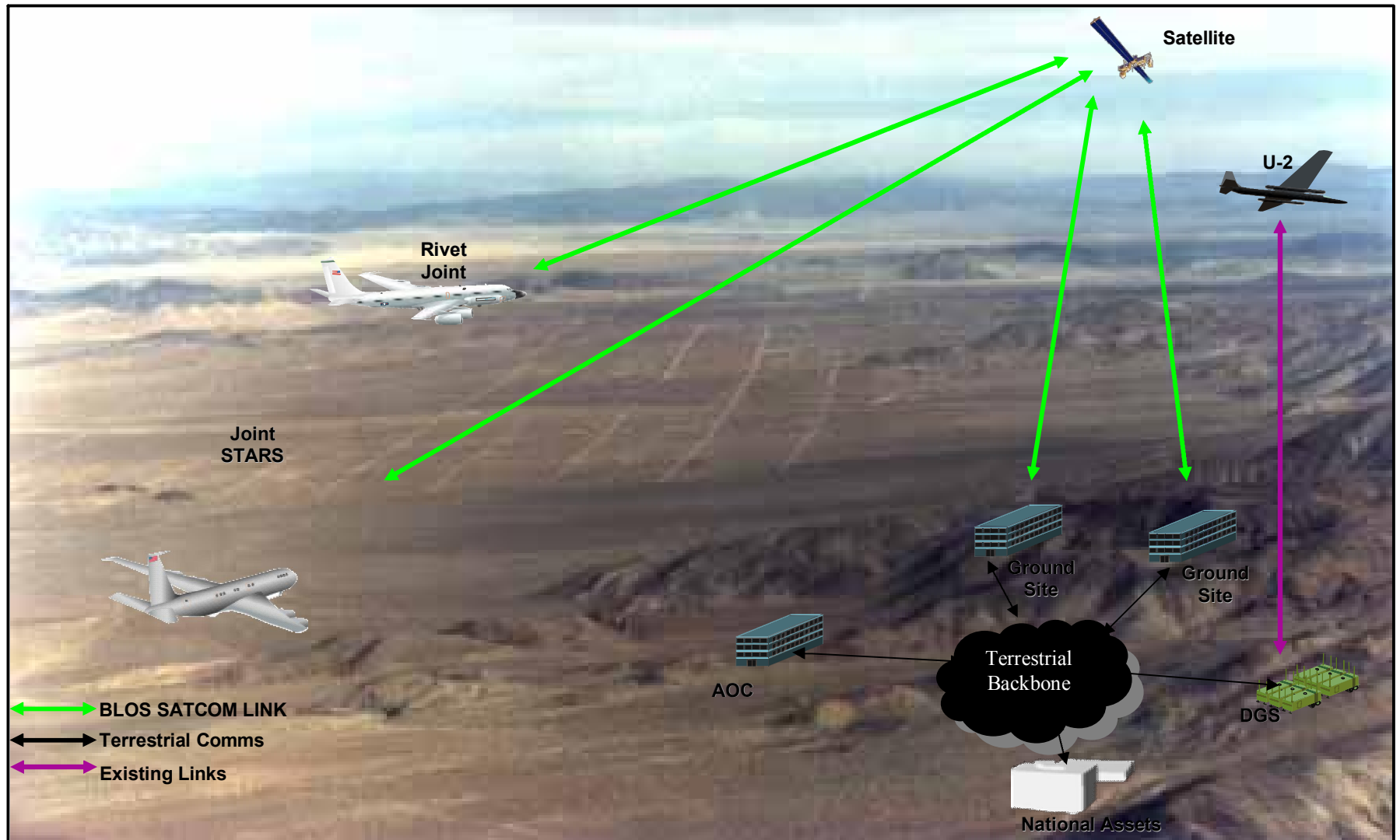


Operational Level Programs





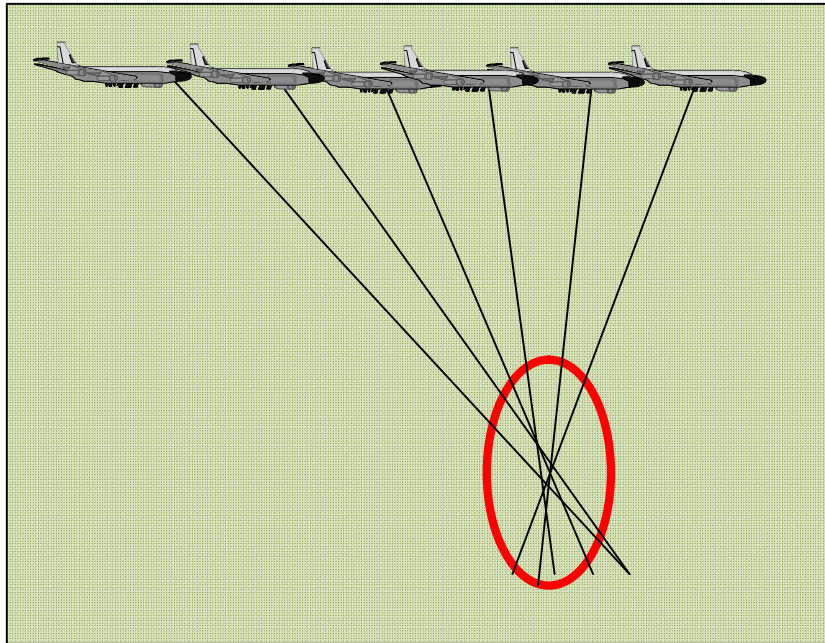
NCCT





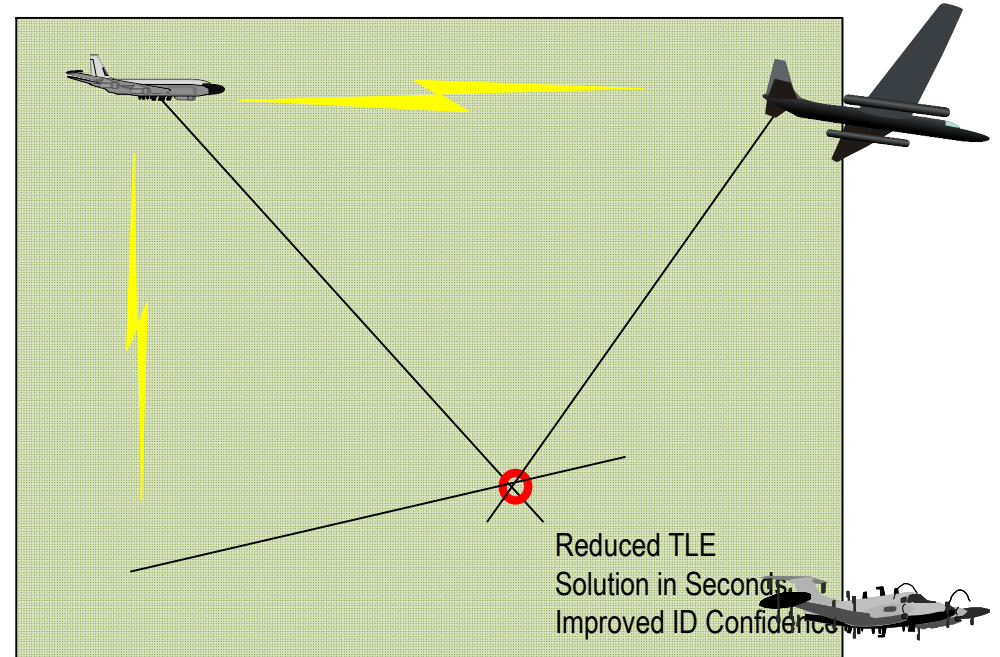
NCCT: The Payoff

Stand Alone Platform



- **Stand alone platforms**
- **Single-Int**
- **Tens of minutes**
- **Coarse location, if target stays on the air**

NCCT Networked Platforms



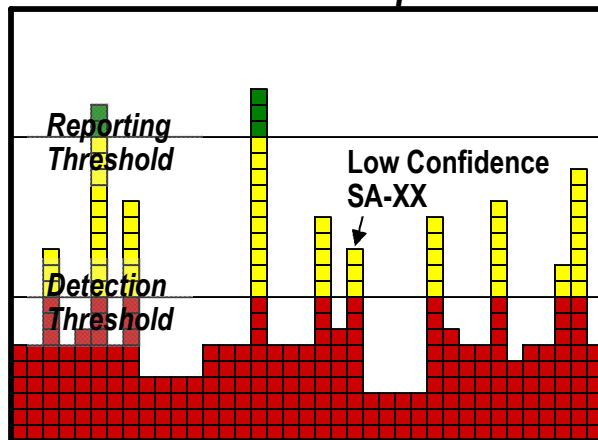
- **Networked platforms**
- **Diverse Sensors / Multi-Int**
- **Seconds to a few minutes**
- **Accurate location, even if target is short up-time**



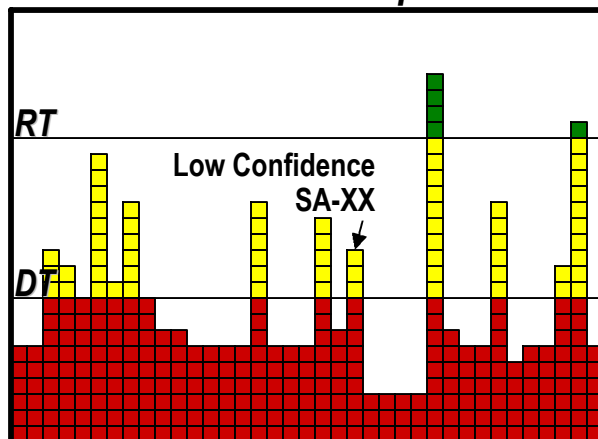
NCCT Process Example

Network-Centric Sensing

Platform 1 Sensor Perspective



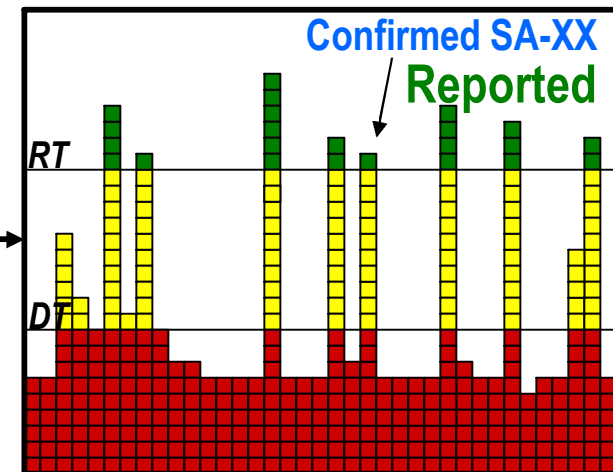
Platform 2 Sensor Perspective



Correlation
Function

Σ

Network-Centric Sensor Perspective



- Sensors automatically exchange **Yellow** data

NCCT Creates New Information via Machine-to-machine Ops



NCCT Process Example

Network-Centric Sensing



Both assets work in isolation and each have low confidence data

-Target Never Reported



Assets networked jointly collecting

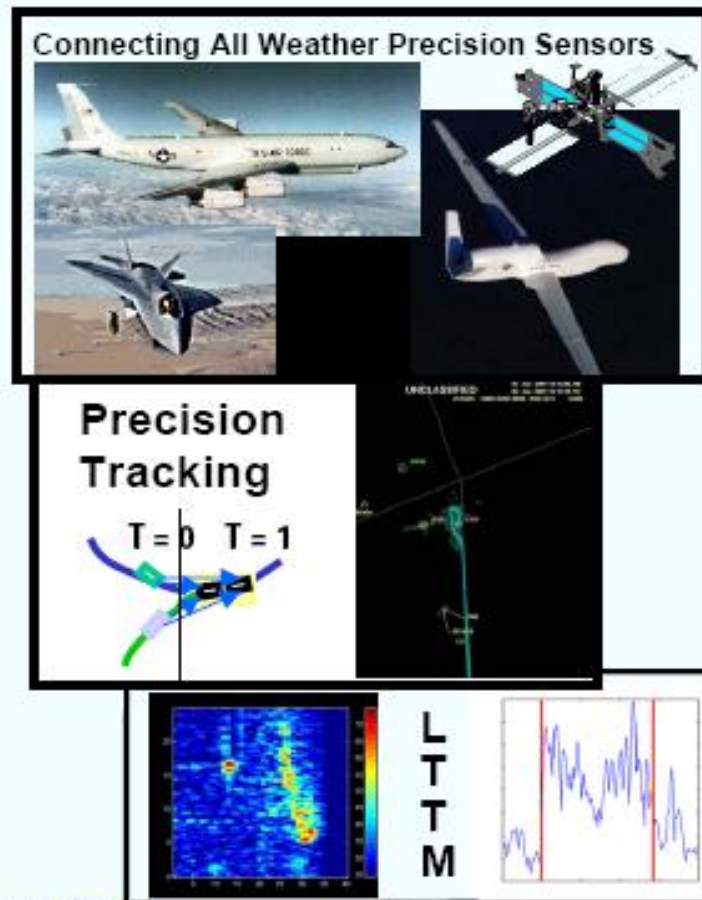
- Shared data focuses & cues collection efforts of all assets
- All new data is correlated
- Low threshold targets no longer slip through the cracks

-Targets are created and reported



AMSTE Program

- Key AMSTE Technology Advancement





Resultant Fury

UNCLASSIFIED

RESULTANT FURY

23 NOVEMBER 2004

Target: ex LST-1185 Schenectady

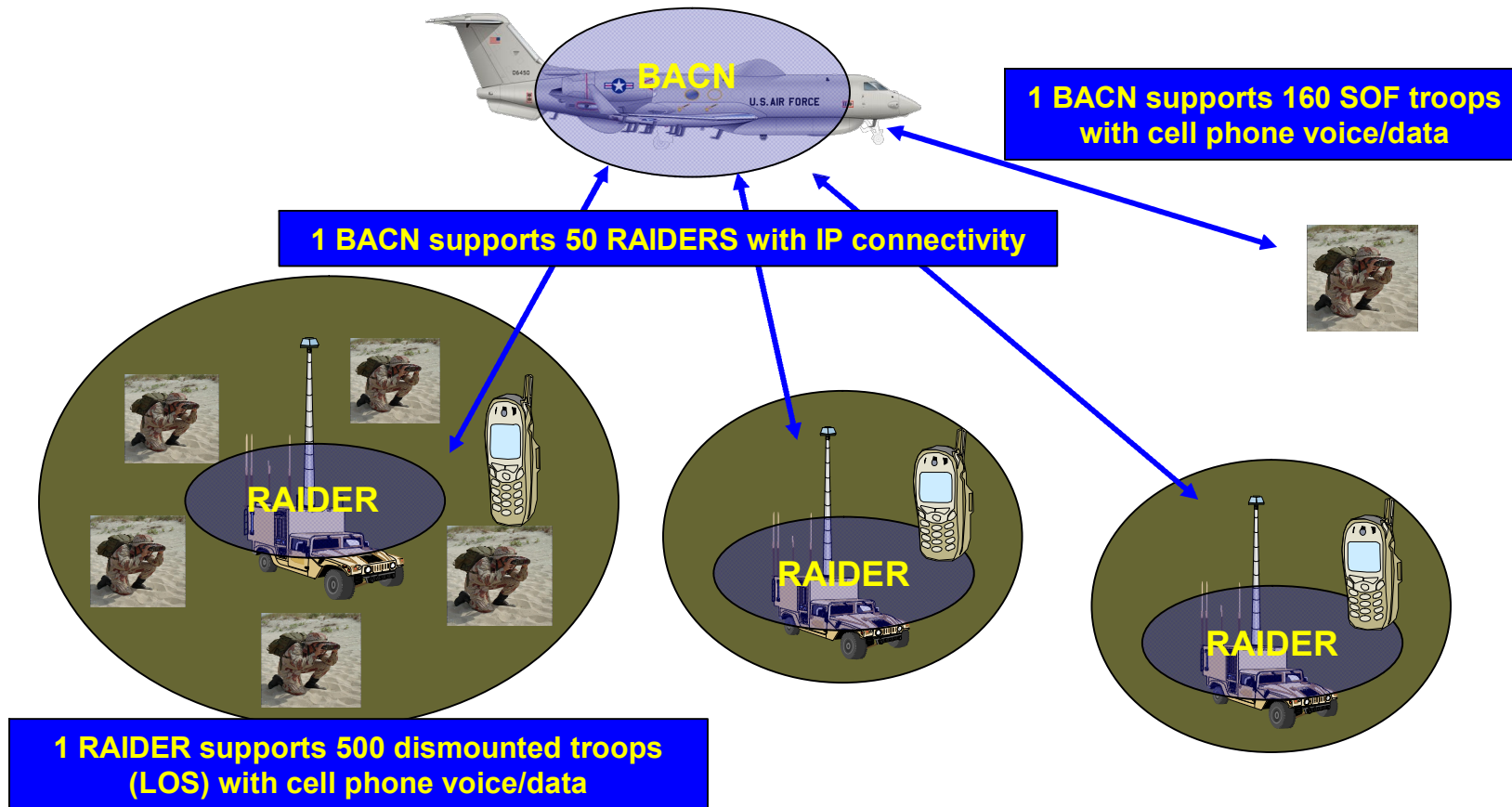
Pacific Missile Range Facility



BACN & RAIDER...Communications

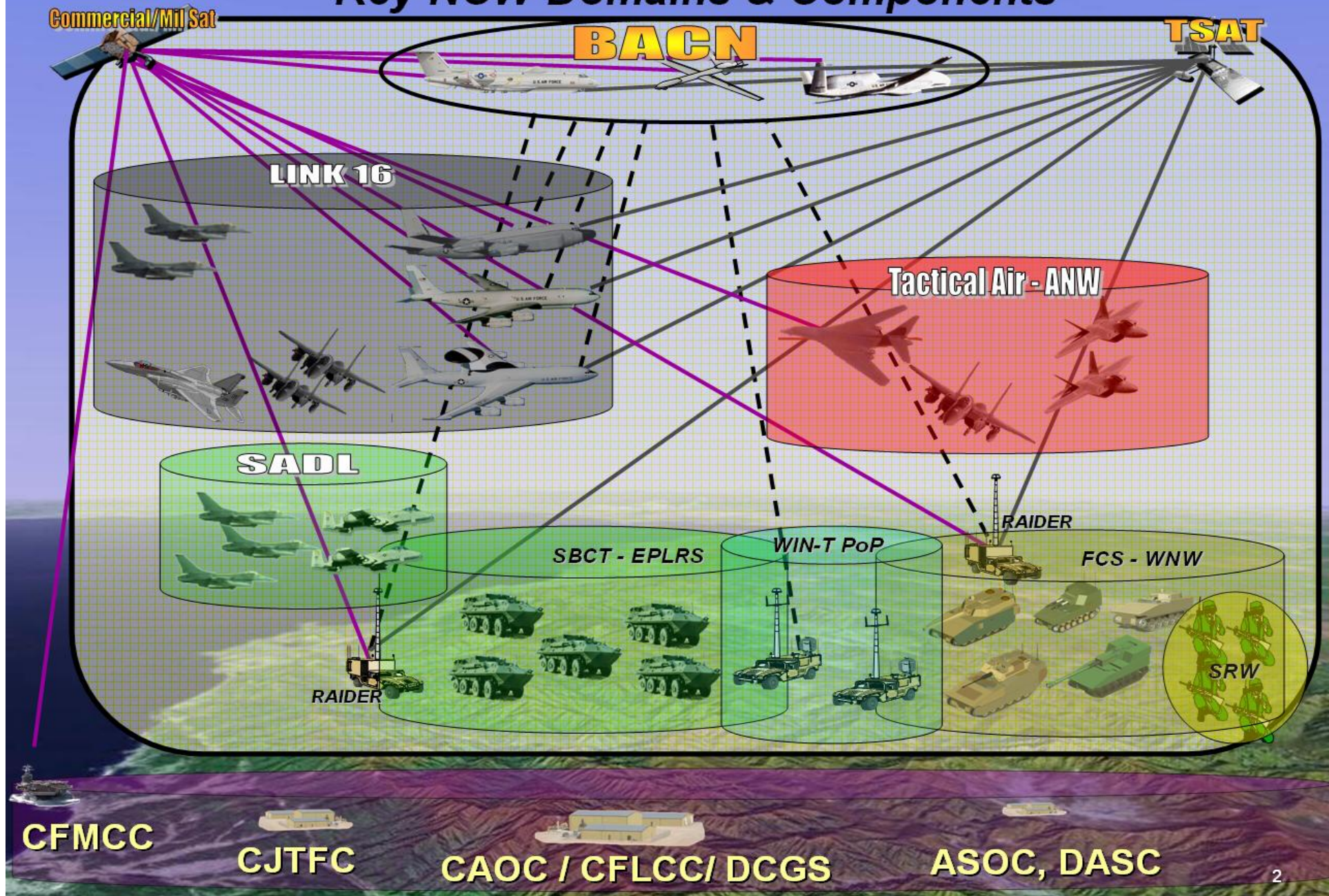
'Spine'

AF contribution to edge connectivity



Connect Soldiers, Marines & Battlefield Airmen to GIG

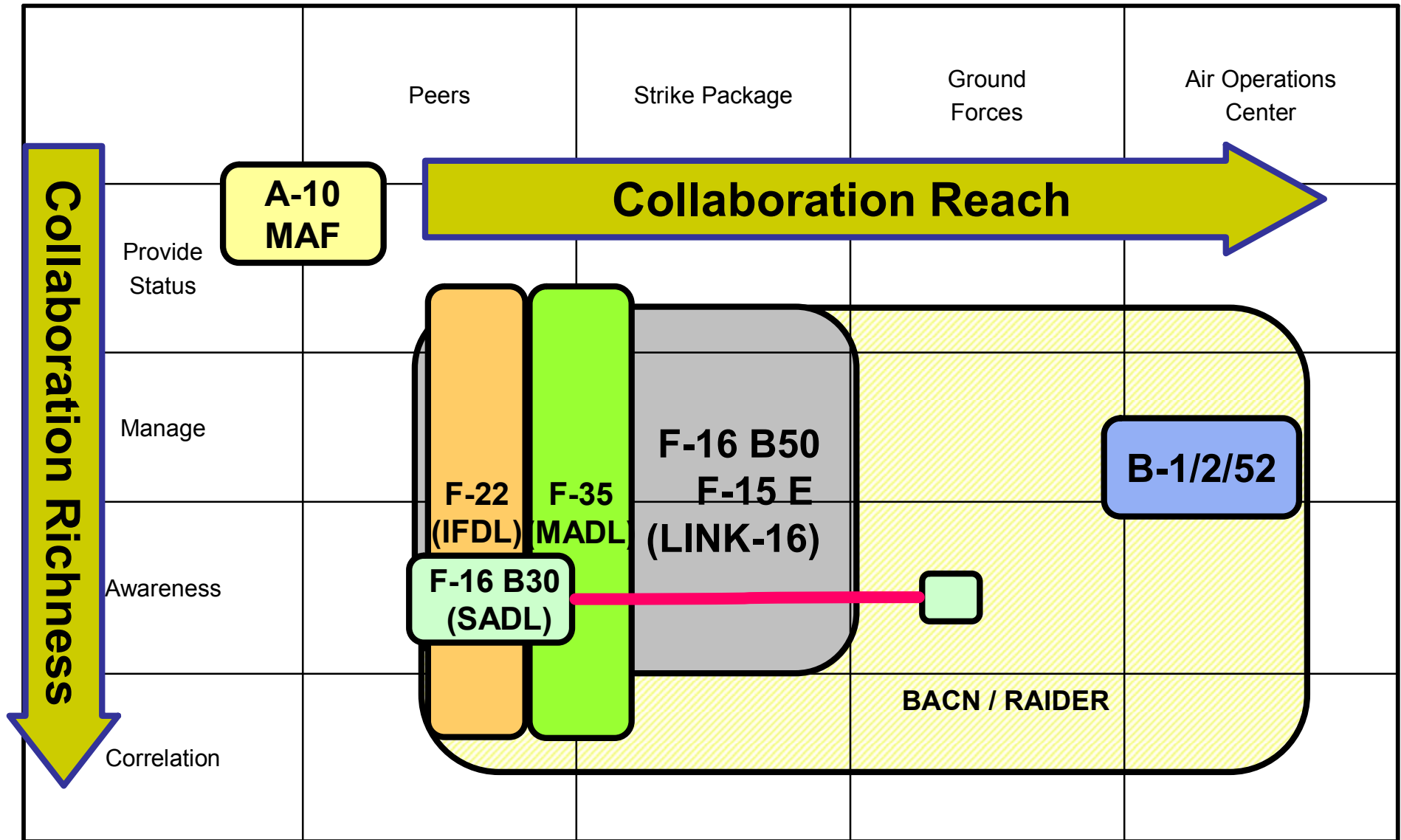
Key NCW Domains & Components





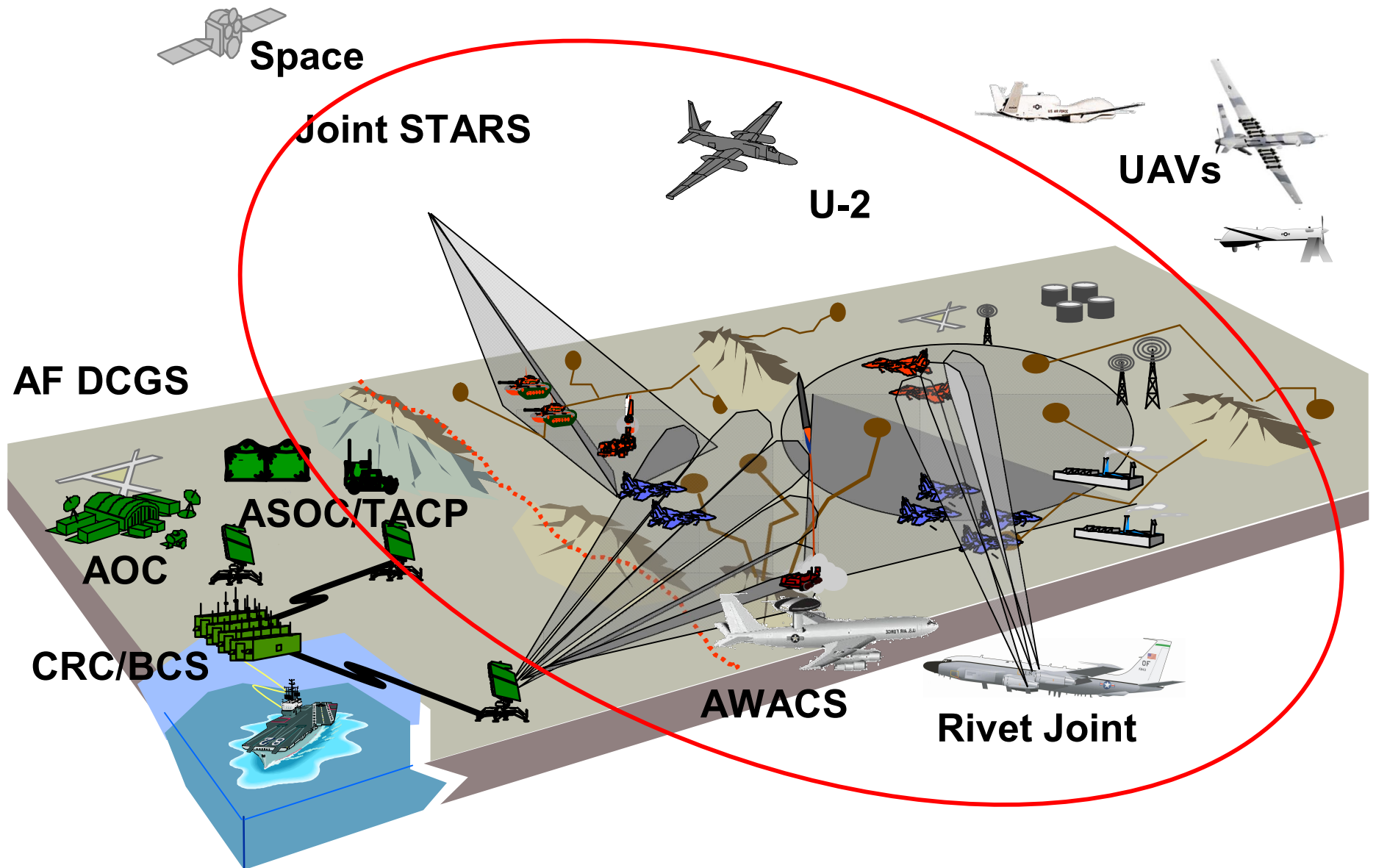
Current Collaboration Capability

Strike Platforms BACN & RAIDER Allow Better Platform Options





C2ISR Integration





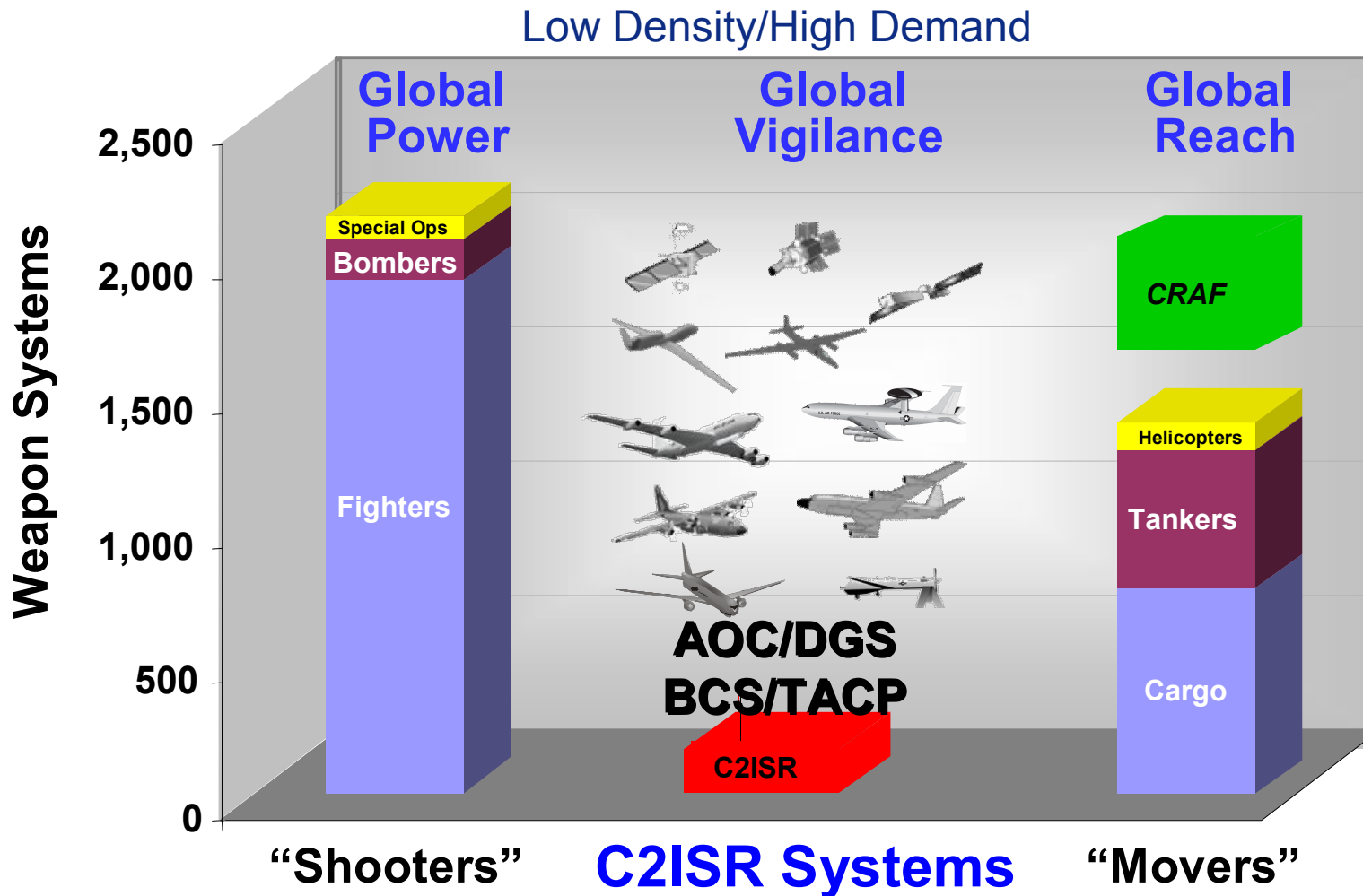
Air Force C2ISR Common HMI



- Enables information sharing across battlespace
- Provides critical battle management functionality
- Enhances operator's situational awareness



C2ISR -- Integral Player for a Winning Team



Combatant Commanders Want More Persistent ISR Coverage



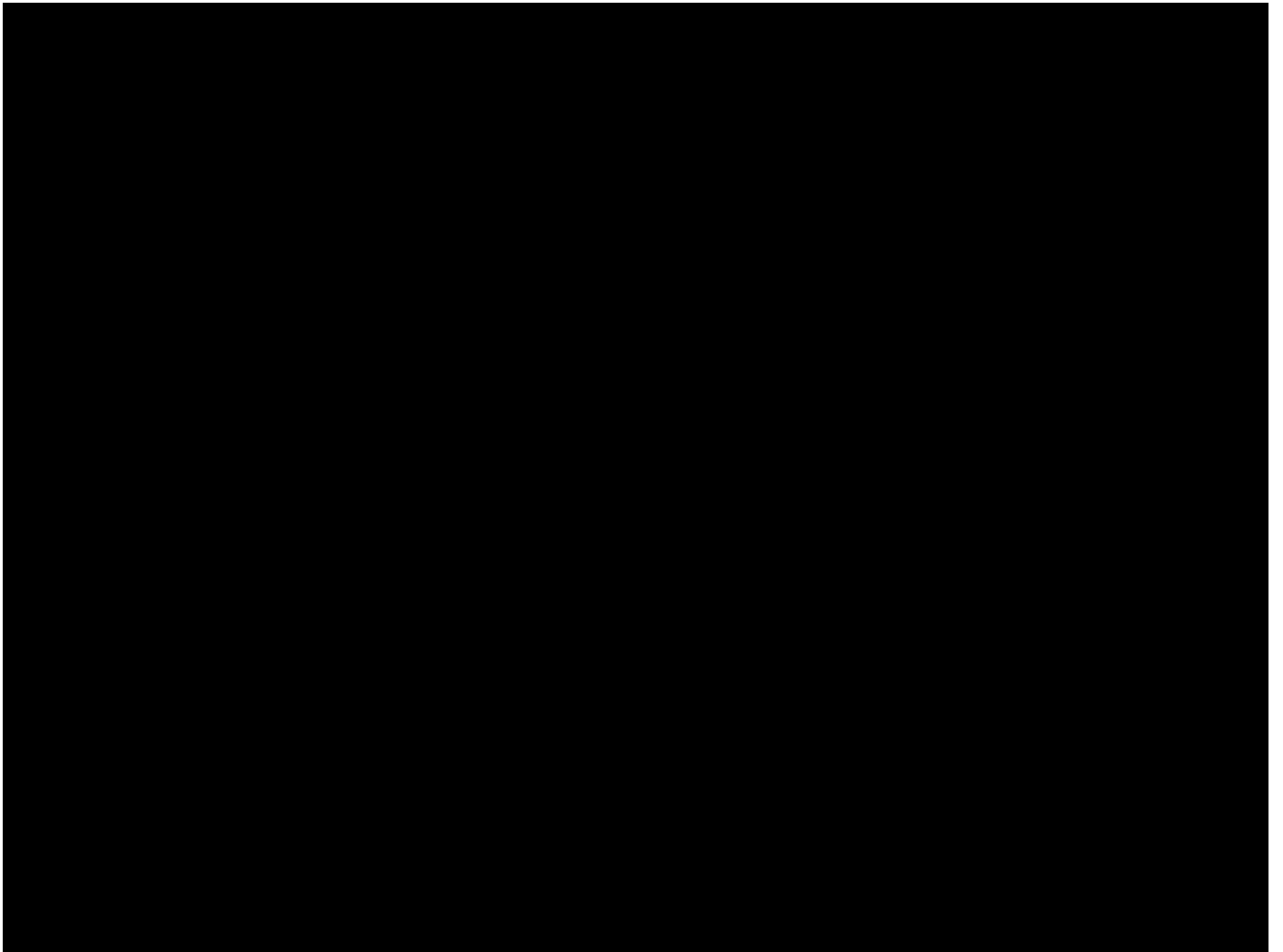
Video





Questions

?

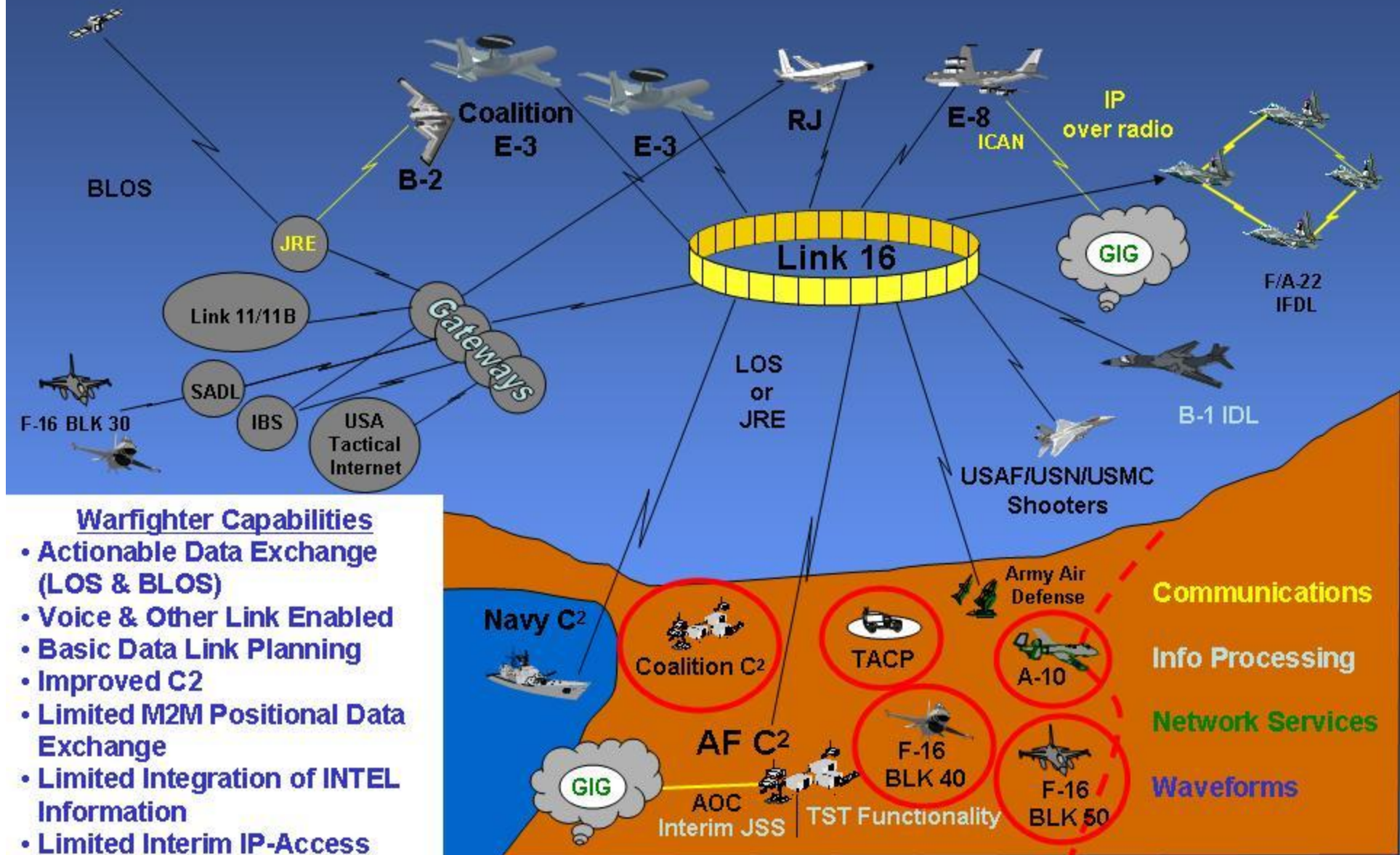




BACK UP SLIDES



Initial Point (FY05)





Target (FY20)

Satellite Grid



Theater Grid



Strategic/Tactical Grids



Weapon Grids



Surface Grids



Warfighter Capabilities

- Global Information Access
- Connectivity between GIG and legacy systems



NCCT Program Overview

- **NCCT applies common software applications to change how sensors gather information**
 - **Software application provides machine-to-machine rules to operate as a collaborative sensor network**
 - **NCCT rapidly focuses several sensors on common targets simultaneously to get very accurate target information in near-real-time**
- **Initial Military Utility Assessment (MUA) Completed in JEFX04**
- **Final MUA Results from Trident Warrior 05 (TW05) Pending**
- **IOC in 2009 based on Joint STARS Funding in FY08 POM**
 - **IOC = 5 x RJ, Joint STARS, DCGS, AOC, AOIO**
- **Prime Integrator: L-3 ComCept, Rockwall, TX**



What ICAN Provides

- **Provides IP-based Network-Centric connectivity**
 - mIRC chat
 - SIPRNET email
 - Joint STARS is the only aircraft with true Mobile IP connectivity in theater
- **Seamless extension of Global Grid to weapons and ISR platforms, providing Net-centric capabilities. A standards-based capability that transforms legacy and commercial radio links into an IP network**
- **Prioritizes all Traffic and Smartly Manages Bandwidth through end-to-end Mission-based QoS**



What ICAN Provides

- **A Pathfinder for JTRS and Net-centric warfare. Risk Reduction to Strengthen JTRS Capability; will shorten path to integration, saving Engineering & Development costs**
 - **Move from Voice to a Data Environment**
- **ICAN is an Intelligent Information Manager, Super Smart Router and a Comm Manager.**
- **ICAN will only be as good as the comm it manages but it is surprising the number of “good” things that can be done even with “dial-up rate” links...**



Phase 3 Test – Sep 05 (China Lake)

**First TTNT Flight Tests Validated
Extensive Analyses, Simulations
and Laboratory Tests**



**Fixed
Installation**

**Low Latency
< 2msecs**

**Net Form
< 5 Secs.**

**No Interference
W/ Link-16**

**Mobile
Installation**

**Missile Control
Messages with
SLAM-ER Lab
Unit Via IP**

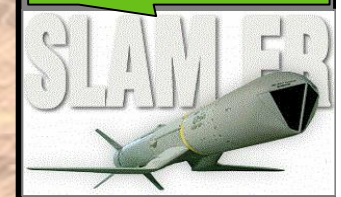
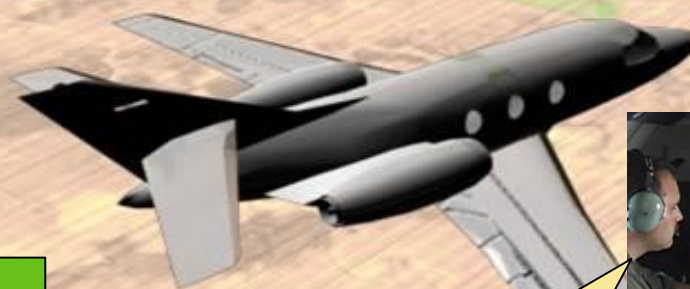
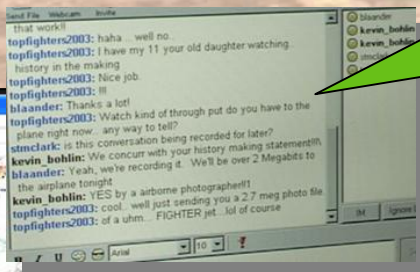
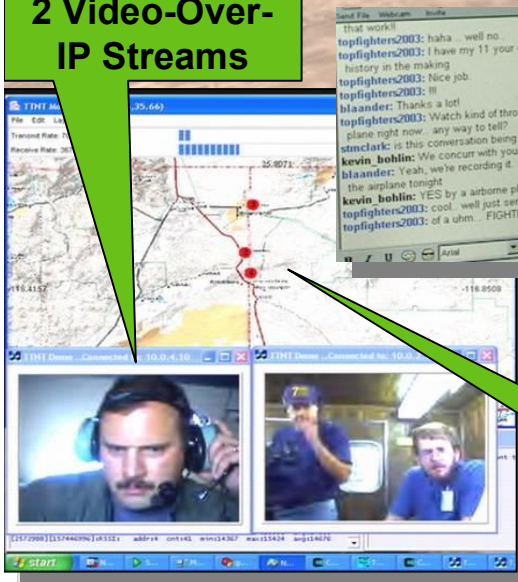
**2 Video-Over-
IP Streams**

**IP YAHOO
Chat
T-39 Screen**

**2.25Mbps
Data Rate**

**Network
Awareness**

**T-39
Installation**





Video

